FOOD STUDY FOR HIGH SCHOOLS

E. R. Decker
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FOOD STUDY
FOR HIGH SCHOOLS

A Montana Wheat Field

FOOD STUDY FOR HIGH SCHOOLS

A TEXTBOOK IN HOME ECONOMICS

BY

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To

MRS. ALICE PELOUBET NORTON

WHOSE TEACHING HAS BEEN THE

SOURCE OF INSPIRATION

OF THIS BOOK

PREFACE

This book is the outgrowth of a popular demand for a revision of "Food Study", a textbook widely used in the high schools of this country. But this new book is not a revision; it is an entirely new text which utilizes the best material of the earlier book but presents the subject as a whole in the light of the tremendous development which has taken place in the past few years.

In preparing the new book it has seemed wise to change the form of presentation. Not only has the text been broken up into paragraphs under definite subheadings, but at all needed points the attempt has been made, not to give less information, but to present it more simply; to leave out information which seemed unnecessary, and to plan for constant home practice as well as other out-of-school work.

The choice of food for health has been brought into greater prominence and the order of lessons has been changed to bring simple calorie work and meal-planning earlier in the course.

The Table of 100-Calorie Portions has been replaced by a Table of Calories from Servings, which it is hoped will so simplify arithmetical calculations that it will prove much more practical. Tables of the vitamin and the mineral content of foods have been added, and height and weight standards as well as food standards have been brought up to date.

ACKNOWLEDGMENT

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FOREWORD TO THE TEACHER

Home Economics is now a well-established subject in high schools, but in too many it is still merely cooking and sewing. It is too often presented as a subject without intellectual appeal. This is partly because of the breadth of the information which is necessary to give understanding of its problems, but not at all because true intellectual training may not be made to result from their solution.

This book is a manual of definite directions and information which will aid not only in preparing the student for future home-making, but which should be of immediate use in interesting her in health and the part played by food in a health program; it is not, however, intended to supersede the teacher.

Home Economics is still so new a study that no apology is necessary for placing another textbook in this subject on the market. Many of the best books which are now available obviously are intended for the benefit of the teacher rather than for the student, while others are little more than carefully selected collections of recipes. The present work is an attempt to present a manual of definite directions and information which will aid the student in her adventure into the subject.

Before the student begins each experiment, she should understand not only what she is attempting to find out but should realize *why* she needs to know the point in question.

Here is a definite place for the teacher to show her skill. This by no means implies that the result itself should be known, for then the value of doing the experiment is largely lost.

If it is necessary to economize on time, the different parts of an experiment may be carried out by various members of the class, and the results reported and discussed. But every member of the class should understand beforehand what is to be found out, and how it is to be done.

This distribution of work, however, is not wise when preparing dishes which call for skill in handling or involve some special principles in combining or in cooking; but there is no reason why one student may not prepare bean soup while her neighbor makes potato soup. Such a practice often helps to impress underlying principles. Even college classes have been known to finish their course in cooking with the idea that a special recipe was necessary for each kind of soup or cake, and without the knowledge of proportions which would tell them when a recipe was outside the bounds of possibility. This is the result of cooking entirely from recipes. On the other hand, an error quite as bad is made when recipes are never used.

The order of the topics in this book is not that of the conventional cook book, nor is it based on the chief food principles, but is a logical working out of the subject and makes possible certain advantages in presentation, as the early introduction of such subjects as meals and serving. This gives opportunity for the economic study needed as a basis for household management — all too often omitted from courses in home economics — and also affords an occasion for necessary repetition of work, if skill as well as knowledge is to be acquired. But skill from the repetition of cooking processes should for the most part be acquired

by the actual carrying out of work at home. For this purpose, as well as to help the carrying over of the work into the home, material for Home Work appears in every section. This includes recipes which involve no processes different from those the girls will have already learned, or which are so simple that they should cause no trouble in the carrying out of the directions. It includes also topics to be reported upon which should make the girls both more observant of, and more interested in what is going on around them.

The divisions I, II, III, and the like do not mean divisions of single lessons. The experiments and the cooking presented in each chapter can usually be carried out in a double period of an hour and a half. Following the laboratory work of each chapter of the text is material intended to be taken up in subsequent recitations. A double period for laboratory work and a recitation period form a unit of work which may be given once or twice a week, or oftener if time permits.

Canning and jelly-making are placed first in the course, not because it is the logical order, but because autumn is the best time in the school year to obtain the necessary fruits. In general, the amount of skill required in every process has been considered in determining its place in the order of lessons. For this reason the dough and batter series has not been introduced directly after the first study of starch, but has been placed after the meat and vegetable work. But since a laboratory using many ovens becomes exceedingly warm, the roasting of meat and the baking of bread, cake, and pies are not left until the end of the course, for less hot work is desirable at the end of the school year.

It has not seemed needful to explain such processes as how to break an egg, how to beat eggs, how to "fold"

in the whites, how to use a rolling-pin, and all the rest. The teacher who shows the process can make it plainer than any words can do.

It is hoped that the Table of Calories from Servings will do away with much of the useless arithmetical calculation which leads many home-economics teachers to omit work that is truly necessary to the understanding of nutrition. Although the results obtained from the use of the table are only approximately exact, no method short of the weighing and analysis of samples of the actual foods eaten gives really exact figures.

The Table of Mineral Salts should also be of great practical value. By its use one can approximate the mineral content of a day's meals in a few minutes. If our diet is low in iron, for example, what we do to better the condition is to try to substitute foods that contain iron for those that do not; but since we actually add the food to our diet in "servings" it is most helpful to know what *servings* contain enough of this substance to be useful. Even the Table of Vitamins will give roughly quantitative measures of the worth of certain foods. Such knowledge is valuable, for authorities are now telling us that it matters much more what we eat than how it is prepared, so long as the valuable constituents of the foods are not destroyed or lost during the process of preparation.

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WHY WE NEED TO STUDY FOOD

What Shall We Eat?

SHALL we eat only what we happen to like? In olden times savages and primitive people probably ate what they could get. Then they could not restrict their choice to certain foods because they liked the taste of them, nor were such selected foods known as white bread made out of just one part of the wheat grain, or sugar separated from the rest of the sugar cane. Necessity forced them to eat many different kinds of food. But as civilization has advanced and we have learned how to cultivate plants and animals for food, how to ship them, and how to preserve them by cold storage and other methods, we have now such a great food supply that it has become increasingly possible to yield to our whims and fancies for this or that kind of food.

On the other hand, the scientists are more and more convinced that being well fed is not just a matter of getting enough food. Different foods contain different elements, each of which has its special part to play in the body, and unless we get enough of all of these various elements we may have all the food we can eat and still not be well fed.

We have discovered, too, that only when our food is properly balanced do we grow properly, have strength and energy for work and play, and the resistance necessary to escape disease. No one who is poorly fed can long be either healthy or beautiful.

"Positive Health"

This is the new phrase that they tell us is used to express our new ideas in regard to health. What does it mean? It seems there have been three stages in our ideas about health. In the first, we thought about health as something we lacked when we were sick and took medicine. Next, we realized that by sanitary precautions — such as excluding flies, avoiding contaminated food, and keeping away from contagious diseases — we could prevent much sickness. But now we are realizing that there is a difference between being "positively well" and just not "actively sick." To be "positively" well means being at our very best mentally as well as physically, not tired, not subject to colds or any other ailments, not ill-tempered — having nothing at all the matter with us.

Herbert Hoover, whom we honor for the work he did during the war as head of the Food Administration, said in a public letter sent out in 1923 that our physicians report that less than 20% of our people reach maturity in normal physical health. Is it not time that we realize the importance of right living to maintain positive health? One important factor in healthful living is the right choice of our food.

True Economy

Our modern lives are very full. Formerly people did not consider time of much value, but now we must plan

carefully in order to get in all the worth-while things we are eager for, both in work and in enjoyment. There are so many important things, too, to do with our money that we are realizing that the careful consideration of cost is not an indication of stinginess but a sign of good sense. So, in planning food, we must consider both time and cost as well as health. One meal which seems very much like another may involve three times as much work in preparation, and the real cost of food is not merely the price paid for it in the store, but also the cost of the labor required to prepare it and of the fuel used to cook it.

Food Study Means More than Cooking

From such considerations, it is evident that the planning of meals requires broad knowledge, and it is easy to see why Food Study is taking such a prominent place in school work, and why it involves so much more than the art of cookery.

I

THE COOKING OF FRUIT

CODDLED APPLES
APPLE SAUCE
BAKED APPLES

A. **Class Experiments.** THE SPOILING OF FRUITS.

Put three test tubes, with corks to fit, in a pan of cold water and heat slowly to boiling. Empty the tubes and half fill with uncooked fruit cut in small pieces.

1. Fill up the first tube with cold water, cork, and seal with paraffin or wax.
2. Cover fruit in the second tube with water and boil for three minutes. Fill up with boiling water; cork and seal.
3. Repeat (2), but do not cork the tube.
4. Take a tube which has not been boiled. Cook a little fruit separately and, when it is cooled, put it into the tube. Add enough of the fruit and juice to fill it; cork and seal.

Note results at the end of twenty-four and forty-eight hours, and after several days. Under which conditions does the fruit keep?

B. Keeping Fruit from Breaking While Cooking.

1. Pare a peach. Cook half of it in half a cup of water. When it is tender, add two tablespoons of sugar.
2. Make a syrup of half a cup of water and two tablespoons of sugar, and cook the other half of the peach in it.

Compare the results.

C. Prepare coddled apples and apple sauce.

Coddled Apples.

The apples may be washed and pared and cooked whole, or quartered and cored; but the whole apples or the pieces, whichever are used, should keep their shape. Therefore cook gently. Use one-third as much sugar as water. Judging from the experiments, when shall the sugar be added? A bit of stick cinnamon may be cooked with the apple.

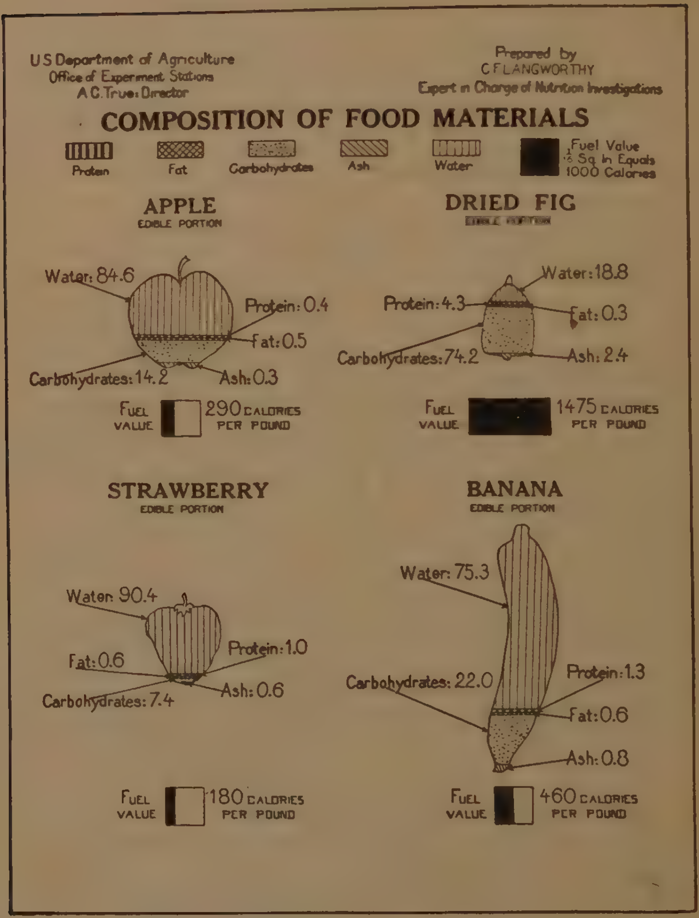
Apple Sauce.

Wash, pare, core, and cut up the apples. Use about one-third of a cup of water to an apple, and one-third as much sugar as water. Here the apple should not keep its shape. When shall the sugar be added? One-half teaspoon of lemon or nutmeg or cinnamon may be added.

Fruit in the Diet

What is Fruit?

The botanist defines fruit as the seed-bearing parts of a plant. However, we commonly call some of the fruits vegetables; as, for example, tomatoes, cucumbers, and squash. Then there are a few vegetables, such as rhubarb, which we use and think of as fruit.



COMPOSITION OF FRUITS

Reasons for Eating Fruit

Fruits are particularly desirable in the diet, partly because of their flavor. They may greatly increase the palatability of an otherwise somewhat tasteless meal — jam on our bread appeals to most of us. Increased palatability may mean increased digestibility, so that for this reason alone we should feel justified in including fruit in the diet, but there are other important reasons for its use, as we see when we consider their composition.

Some fruits contain so much water that they are often thought of as mere flavor food. Watermelons and strawberries, for example, contain more than ninety per cent water. But all fruit has real food value, for even these watery fruits contain much sugar. One large-sized orange, for example, will furnish as much nourishment as an egg, or as a banana, or as two small apples.

The flavor of different fruits is due to sugars, acids, and "ethereal" bodies. These ethereal bodies, or volatile oils, as they are sometimes called, are present in such small quantities that they are sometimes impossible to detect chemically, but it is undoubtedly because of their presence that different fruits have distinctive flavors. The acids present are known as organic acids. In fruits there are such acids as malic, tartaric, and citric. Some of these are burned in the body and supply the body with energy.

The salts that are present in fruits are among their most valuable ingredients. Fruits and vegetables are the foods which supply us with most of these salts, and so help in many ways in keeping the body in good condition. Among other things, the acids and salts in some fruits have a laxative effect. Prunes and figs are examples of this class. Blackberries and peaches are not laxative. Most other fruits rank between these two groups.

Perhaps the most important reason of all for eating fruit is on account of its vitamin content. Vitamins are substances which exist in foods in such minute amounts and are so easily changed that we have almost despaired of ever being able to isolate them. Recently, we seem to be solving this problem, however; but we still know very little of their chemical composition. We do know, however, that they have very wonderful effects, even in such small quantities as we find them present in foods. This we have proved by feeding animals on diets that did not contain them, seeing how these animals failed to grow or in what ways they became ill, and how quickly they could be cured by the addition to their diet of the foods that contained the appropriate vitamin. As fruits seem to be good sources for these very valuable substances, we need them for this reason; as some of the vitamins are rather easily destroyed by being cooked, raw foods are especially good for us, and fruit is one of the foods which we are most likely to eat raw. On the other hand, although the amount of fiber present in fruits is small compared with the amount in vegetables, there is enough to make some varieties distinctly more digestible if cooked, because cooking softens the fruit.

Digestibility of Fruit

The first fruits given to children are orange juice, cooked apples, and prune pulp. Later they have grape-fruit, grapes, and stewed fruit which is not seedy. Adults with delicate digestions usually confine themselves to this same list. Bananas contain a good deal of starch if they are unripe, and so in this condition are not very digestible unless they are cooked. When they are kept until the skins are dark, the starch is largely changed into sugar and the fruit is easily digested. The "strings",

sometimes left on the banana when it is peeled, are indigestible. As a whole, fruits are digestible, although some people have idiosyncrasies which make a particular fruit disagree with them. Over-ripe or green fruit is, of course, harmful.

Since much of our fruit is eaten raw, fruit should be kept as clean as possible while it is marketed. All fruits should be washed before being eaten, even fruits like bananas and oranges, the skins of which we do not eat, because we are likely to handle first the skin and then the fruit. Such fruits as apples and oranges may be washed and rubbed with a cloth to clean them. Fruits that have sticky surfaces, especially if these have dried, are harder to clean and need to be washed in two or three waters. It is better to select packages of dates or figs which are protected from the dust, even if they cost slightly more, than to buy those that are exposed to dirt and flies.

Value of Dried Fruit

Dried fruits are, of course, more nutritious, pound for pound, than fresh fruits. A pound of fresh fruit will give about six ounces when dried. A pound of dried fruit, then, will be nearly three times as nutritious as a pound of fresh fruit. We must take facts like these into account when we consider whether dried or fresh fruit is more expensive. We pay more for a pound of raisins than for a pound of grapes, but since the raisins contain so much less water we really are paying less for the amount of food material to be obtained from them. However, it is possible that dried fruits furnish less Vitamin C than is found in fresh fruits.

Fortunately it is much easier to obtain fresh fruits in winter than used to be the case. Only a few years ago bananas could be obtained only in the larger cities, and oranges and lemons were very expensive and grapefruit

quite unknown. Now conditions have changed. Transportation is so much more rapid that with the development of refrigeration we can have fruit shipped from a distance and so are enabled to have fresh fruit all the year round.

Fruit, then, should not be considered merely as a luxury; and some fruit should be included in every diet. If it is necessary to count the pennies, choose the cheaper varieties, which, fortunately, are as good for us as the more expensive.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1374. "Care of Food in the Home", pp. 3 and 9.

Year Book, U. S. Dept. of Agriculture, Separate 610. "Raisins, Figs, and Other Dried Fruits and Their Use."

Questions

1. What is the value of fruit as food?
2. Which of these values is retained in cooked and preserved fruits?
3. Vitamin C is one of the chief vitamins that we expect to obtain from eating fresh fruits. Just how much of this vitamin is present in each fruit has been determined in only a few cases. Look in the Vitamin Table in this book and list those fruits which contain appreciable quantities of this vitamin.

Home Work

1. Prepare the fruit for the table every day for a week. Report what you served and how you prepared it. Bake some apples.

Baked Apples.

Wash the apples, coring them or not as you prefer. Put them in a baking pan and sprinkle a tablespoon of

sugar over each apple. Put a little water in the bottom of the pan, unless the apples are very juicy, and bake in a slow oven. Different varieties of apples require different lengths of time to cook. They should be soft all through when they are done.

2. Make a list of the common fresh fruits, giving their seasons and usual cost when in season.

3. Make a list of dried fruits in common use and find out their present cost per pound.

4. Would it pay your family to buy a barrel of apples instead of puchasing them in smaller quantities? Have you a good place to store them? What care of them would you have to give?

5. Suggest five different dishes made with dried fruits; four or five desserts made with apples. (Use a cook book for suggestions, if necessary.)

6. If you cut an orange or a lemon with a steel knife and do not wash it at once, what happens?

II

CANNING

Canned Fruit

Canned Peaches

A. **Class Experiment.** One Cause of Fruit Spoiling.

Take a piece of bread, moisten it with water, and leave it exposed upon a plate during the lesson. Then cover with a saucer; leave for two days. If possible, examine under a microscope.

B. To Can Fruit.

There are two methods of canning fruit. In the one given here, the material used is packed in the can before it is cooked.

One Method of Canning Peaches

First sterilize the jars and covers as the test tubes were sterilized in the last lesson, by boiling them in water for five minutes. Leave them in the water until you wish to use them. Meanwhile, scald the peaches by dipping them in boiling water long enough to loosen the skin; peel, cut in halves, remove the stones, and pack the cut pieces into the jars. About ten peaches can be packed in a quart jar.

Fill each jar with hot syrup made by bringing some sugar

and water to the boiling point. The syrup may be thin, medium, or thick, according to your taste. For thin syrup, use one part of sugar to *three* parts of water. For medium syrup, use one part of sugar to *two* parts of water. For thick syrup, use one part of sugar to *one* part of water. In canning fruit, the amount of sugar used is generally about a fourth to a third of the weight of the fruit.

After the syrup is added, place the rubber on the jar and either screw on the top about halfway down or, if the jar has a bail top, fasten only the top bail in place. If tin cans are used, they should be completely sealed.

The jars are now ready to be "processed." This may be done by placing them on a rack in a water bath (have the water deep enough to be one inch above the jar) and boiling the water bath. Count the time from the moment the water really boils, and continue the boiling for twenty minutes if you are using quart jars (five minutes less if pints). Then remove the jars, seal them tightly, and invert them to be sure that they do not leak.

Instead of processing in hot water, the jars may be put in a steamer and steamed for a few moments longer than the time given for boiling; or the jars may be placed in a moderate oven and cooked until the fruit looks clear and waxy.

This method of canning fruit may be used with apples, apricots, berries, cherries, pineapples, and plums, as well as peaches. Cherries, however, should be processed twenty-five minutes, and pineapples thirty. Use a medium syrup for sweet cherries and berries, and a thick syrup for sour cherries, currants, and gooseberries. Plums should be pricked before packing. Pears should be cooked from four to eight minutes in medium syrup before putting in the jars, then the syrup added, and the whole processed twenty minutes. Tomatoes should be scalded and peeled,

put in the jars, covered with hot tomato juice, a teaspoon of salt added to each quart jar, and then processed twenty-five minutes.

In very high altitudes, the period of processing must be longer because the water boils at a lower temperature. If the altitude is more than one thousand feet, increase the length of time ten per cent for each five hundred feet.

In this method of canning, the food is not cooked until after it is put into the jar. One advantage of this is that fruit canned in this way is less likely to break into pieces. It is especially recommended for berries. Fruit canned in this way is likely to taste more like fresh fruit, and also to have a better color than canned fruit that is cooked before it is put into the jars.

Why Canning Preserves Foods

Everyone knows that canning makes foods keep, but not everyone understands just why foods spoil. If you will inquire, you will find that many people are successful in canning and you will find also that those who do not succeed are usually the ones who do not really understand what they are trying to do.

Why Foods Spoil

It was not until the middle of the nineteenth century that Pasteur, a Frenchman, discovered that the spoiling of food is due to the changes brought about in it by the growth of tiny plants; although Appert, another Frenchman, had before that, by inventing canning, won the prize offered by Napoleon to anyone who would find a practical way to preserve food. Because the plants that bring about these changes in food are too small to be seen by the naked eye, it was not until microscopes had been

invented and this hitherto unseen world studied that people could understand the phenomenon.

These microscopic organisms are really very interesting plants. They are often called germs; sometimes, quite appropriately, microörganisms. The botanist may speak of them as colorless plants or fungi, because they do not contain chlorophyll, the coloring matter which makes an ordinary plant green. The fungi also include mushrooms and toadstools, but of more interest to the housekeeper are molds, yeasts, and bacteria. These microscopic plants do not have leaves and roots like ordinary plants, but like them they must have food and moisture. Ordinary plants live on the mineral foods which they find in the ground, but these plants, because they contain no chlorophyll, live on the kind of food that we eat.

Molds are especially likely to grow on fruits, so let us see what these tiny plants are like.

Molds

Molds are not entirely invisible to our eyes. We can easily see masses of them growing on food, but few of us have ever looked at them closely enough to realize how beautiful they really are. When they begin growing, they appear at first as soft, fluffy masses which are made up of a tangle of much-branded threads. Each thread, called a mycelium, looks white as it is seen ordinarily, but appears nearly colorless under a microscope. When the mold is older, perhaps after two days, it may show a color, blue, green, brown, black, red, or pink, each color marking a different variety of mold. The color is due to the so-called spores, which are reproductive bodies and which, if they contain nutritive material, would be seeds. Each different species of mold has a different way of forming spores.

Perhaps the most common household mold, one that is almost always found on moldy bread, is penicillium. This is a blue mold; that is, at the time of spore formation, it becomes blue, or bluish-green. This color is due to the color of the spores themselves. When the mold is a day or two old, the mycelium sends up vertical threads which soon branch. Then each branch divides as if it were trying to make beads of itself, until finally it is nothing more than a string of little round balls, each of which is a spore. These spores are so light that a breath of wind blows them away, and they float off in the air in search of new food material.

From Conn's "Bacteria, Yeasts, and Molds in the Home."

PENICILLIUM, COMMON MOLD, AS SEEN UNDER THE MICROSCOPE

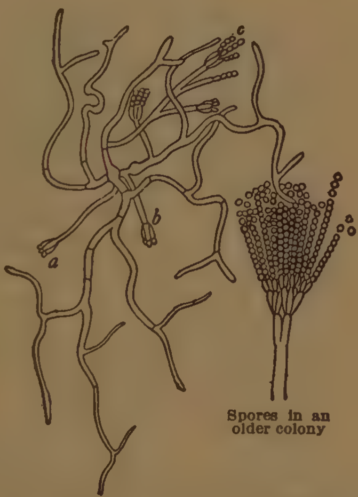
Mucor, another mold commonly found on bread, is coarser than penicillium, so that the threads are seen more easily. When it is ready to form spores, the vertical threads, instead of branching, form on their ends small round knobs or sacs, and inside these balls are formed thousands of spores, which, when the sac bursts, are sown broadcast. These knobs on the mold look like small black specks.

Another mold, aspergillus, instead of forming the spores inside the sac, forms them as beads on the outside.

How Molds Affect Food

During the process of growth, all these molds may send their branching threads deep down into the food on which they are growing, so that more than the surface may be affected. As a result of their growth, they soon change not only the appearance of the food, but the flavor and odor as well. If the mold is allowed to go on growing, the food may be entirely spoiled. On the other hand, some molds produce delicious flavors, and many of these distinctive flavors of our different cheeses are produced in this way.

Spores of Penicillium Sprouting



From Conn's "Bacteria, Yeasts, and Molds in the Home."

Growth from Two Spores, Two Days Later

Molds Are Killed by Heat

Fruits are particularly subject to decay as a result of mold action. If the skin of fruit is broken, the

molds have an especially good chance to get at the food material inside and begin the process of decay.

From Conn's "Bacteria, Yeasts, and Molds in the Home."

Mucor, another Mold found on Bread

A temperature as hot as boiling, or even a little lower, will soon kill a plant, and molds are no exception to this rule. When fruit is canned, then, it is heated not so much to cook the fruit as to be sure that it contains no live spores; and then it must be put away air-tight so that no new spores can blow in. This is

From Conn's "Bacteria, Yeasts, and Molds in the Home."

Aspergillus, showing Mycelium and Spore Clusters

one of the things accomplished in canning, although the plants to be guarded against may be bacteria and yeasts as well as molds.

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U. S. Dept. of Agriculture. Miscellaneous Circular No. 24. "Time Tables for the Home Canning of Fruits and Vegetables."

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1374. "Care of Food in the Home."

Questions

1. Why must canned fruit be kept covered and air-tight?
2. After a jar is sterilized why should it not be wiped out with the dish cloth? Why must care be taken not to touch the inside of the jar with the fingers?
3. Why is the rubber dipped in boiling water, and why is it not boiled with the jar and cover?
4. What different styles of cans are commonly used? Discuss the advantages of each kind.

Home Work

1. Compare the cost of a can of fruit canned at home with the cost of one bought at the store. Count in the cost of the jar itself. Do you think it is wise to try to can fruit at home? Does it pay if you have to buy the fruit for canning?

2. Perhaps you can assist some one in canning some fruit, or even try doing it by yourself. Do not attempt to do more than a can or two at a time until you become expert.

III

CANNING *(continued)*

Canned Vegetables

Tomatoes and Corn

A. Another Method of Canning.

Canned Tomatoes

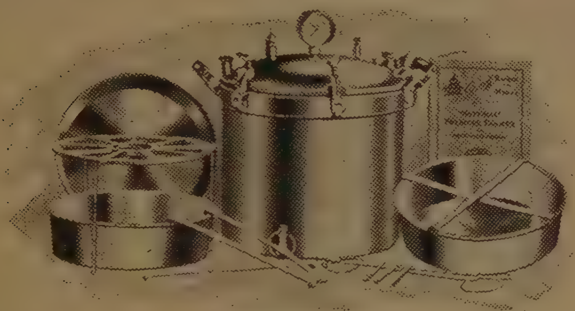
Sterilize the jars and covers as in the other method, but boil them at least ten minutes. Allow one quart can for about every eight to ten tomatoes. Peel the tomatoes by putting them in scalding water for two or three minutes, then in cold water, and pulling off the skins. Cut up the tomatoes, and boil them in a saucepan for ten minutes or more. Do not cook too many at a time or there will be danger of burning. Pour the hot tomatoes into the sterilized jars, adding a teaspoon of salt to each quart. Dip each rubber in boiling water as you put it on the jar, and seal the jars as quickly as possible. To be perfectly sure that the product will keep, it is safer to seal the jars partially and process them in a steamer or hot-water bath for five minutes.

The advantage of this method is the condensation of the product before it is packed. Fruits should be cooked in the syrup in which they will be packed.

B. Canning Non-Acid Vegetables.

1. Canned Corn.

Cut the corn from the cob, cover it with boiling water, and heat it thoroughly, putting it into the jars hot. Do not pack the jars too closely. Add a teaspoon of salt to each quart jar. Partly seal the jars, and either



A Pressure Cooker

process them in a pressure cooker for one hour and twenty minutes at fifteen pounds pressure (or 250° F.), or else heat immediately in a hot-water bath, again fourteen to sixteen hours later, and a third time not more than eighteen hours after the second heating, letting the water in the bath boil for an hour and a quarter each time.

The United States Department of Agriculture does not recommend the hot-water bath for canning non-acid vegetables.

2. Other Vegetables.

Can asparagus, okra, peas, young lima beans, or string beans, using the same method given for canning corn except that asparagus, string beans, and okra need be processed in the pressure cooker at only ten pounds pressure (240° F.) for forty minutes, peas for fifty

minutes, and lima beans for sixty minutes. All greens should be processed at this pressure for an hour and a half. If a pressure cooker cannot be used, process three successive times, as directed in *B*, 1. In very high altitudes vegetables should be processed only in a pressure cooker.

PRESERVING BY THE PRESSURE-COOKER PROCESS

MICROÖRGANISMS AND CANNED GOODS

Action of Yeasts on Food

Fruit preserves, like all fruits cooked with sugar, are especially likely to undergo a change which it is at once evident is not due to mold growth. This is the action that takes place when such foods "work" or ferment. The change is shown by a sharp, pungent taste, and at some stages by the formation of bubbles through the liquid. Whenever this happens, it is a sign that growing yeasts are present. For when yeast plants grow, they are able to break up the sugar in the food and change it partly into alcohol — which gives the stinging taste — and partly into a gas called carbon dioxide, which in escaping through the liquid makes the bubbles. But how is it we do not see the yeast at all?

You will remember that in the last lesson we said that yeast plants are microörganisms, that is, that they are too small to be seen without a microscope. When we buy a

yeast cake, we buy thousands upon thousands of these tiny plants pressed with meal or some other starchy material into the cake that we see. Under the microscope we can see that each of these plants is a small, colorless, oval object which is called a cell. They are even less like ordinary plants than are molds.

When yeast plants begin to grow and produce the result that we call fermentation, they are multiplying rapidly by a method known as budding. In this way new cells are formed, which appear first as very tiny buds on the sides of the first cells and gradually grow larger and larger until they finally separate into independent cells. When active fermentation is going on, the yeast present is always found to be budding.

Yeast plants are so small and light that if they are somewhat dried they can, like the spores of the molds, float about in the air. Then, too, if conditions are unfavorable to the growth of the yeast cells, some yeasts can form within the cell a number of spores, each of which is capable of forming a new cell. The air may be laden with these spores, or with the yeast cells themselves, as well as with the spores of molds.

What Bacteria Are Like

Other microörganisms carried by the air are called bacteria. They are as simple in structure as the yeasts and, like them, consist of single cells. They may, however, be quite different in shape. Some are like little rods and are called bacilli (a bacillus, for a single one), others are like spheres and are called cocci, a third variety is spiral and is named spirilla (in the singular, spirillum). But all these, no matter what shape they may be, reproduce in the same way, and it is this method of reproduction

which distinguishes them from the yeasts. Each cell grows a little longer than it was before and then breaks in two, each half being an individual. This process, known as reproduction by fission, gives to bacteria the name of fission fungi.

Like yeasts, some bacteria can produce spores under unfavorable conditions. A bacterium, however, instead of producing a number of spores, forms only a single one. The advantage of the spore state seems to be in the greater power of resistance that the spore possesses — it is less easily killed by heat or cold or drying. If food is being sterilized and spore-forming bacteria are present, it is quite possible that the heating will kill all of the bacteria but that the spores will be left alive. After some hours, however, the majority of these spores will have again changed themselves into the ordinary forms of bacteria, and a second heating will kill these forms. A third heating is safest to make sure that any remaining spores are destroyed. Because spore-forming bacteria are likely to be present on vegetables, and no acids are present to help kill them, vegetables are much more difficult than fruits to can successfully.

Both yeasts and bacteria are too small to be seen without a microscope; but of the two, yeasts are much the larger. While a yeast cell is about one three-thousandth of an inch in diameter, even the largest bacterium has a diameter of not more than one ten-thousandth of an inch. It might well seem as if organisms as small as this could not do us either much harm or much good, and this would probably be true if it were not for the wonderful rate at which they can multiply. In a bacterium, division may take place every half-hour, and at that rate in only one day, conditions being favorable, a single cell could produce about seventeen million others. If, then, food is

to be kept from spoiling, it is obviously necessary to exclude the entrance of even one bacterium.

How Bacteria Affect Foods

But bacterial action is not always harmful.

When bacteria first act upon food, the result may be only beneficial: the good flavor of butter and some cheeses is undoubtedly due to their action; and the bacteria which cause milk to sour not only are not any more poisonous to us than are any of the other vegetable plants used for food, but they may be of positive benefit in keeping down the growth of more harmful organisms. However, bacteria will finally render food unfit for use, producing decay and putrefaction. But what a world it would be if microörganisms did not bring about these processes! Our earth would be littered with useless material, and the soil would long ago have become exhausted.

Precautions to Take in Canning

In canning, the bacteria are, of all the microörganisms, the most difficult to kill. This is because of the ability of some of them to form resistant spores. If we are using the hot-water method of processing, in the first heating the contents of the jars may not become hot enough to kill the spores; so when we are canning non-acid vegetables, we must either use the pressure cooker or process the jars a number of times.

We should remember when we are canning to work as quickly as possible in order that the food may be exposed to the air just as short a time as possible, and also so that when we fill the cans before processing, the material will still be hot when it is put into the canner. Moreover, all fruits and vegetables for canning should be absolutely

fresh and sound; they should be canned if possible *within two hours of the time when they are picked.* They must be washed thoroughly, especially if there is any earth clinging to them, because some of the bacteria in soil are very difficult to kill.

Before we use them we should test the cans to be sure they do not leak. To do this, fill them with water, seal them, wipe the outside dry, and then turn them upside down and see whether any water comes through. We must be sure, too, that we are using fresh rubbers. Old ones are dry, crack easily, and are no longer elastic, so that they do not seal the jars properly. To test, pinch them to see whether they are still soft and flexible.

Precautions to Use When Opening Canned Goods

One organism, known as botulinus, has caused us much trouble, for if it is not killed, it grows readily in canned goods, and produces a deadly poison in the food. For this reason all canned goods should be inspected carefully when they are opened to see that they are still in good condition. If the cans are of tin, notice their appearance inside. The tin should not be markedly corroded or much blackened. If, in opening a can, there is an "outrush of air", or if the liquid spurts out, it shows that the material is spoiled. If, on the other hand, the air is sucked in, it is a good sign, for it shows that the vacuum has not been destroyed. Next notice whether the contents have the proper color and texture, and whether they smell as they should. It is safer to boil all canned vegetables for five minutes before using *or even tasting* them. In boiling them, be sure that the liquid covers the solid part during the cooking. Canned asparagus, string beans, corn, and spinach or other greens, should *always* be reheated before they are tasted, even if they appear perfectly good.

Remember this when you use these vegetables. If you are going to make salad with them, allow time for the necessary heating and cooling. The reason that boiling makes it safe to use them is because the poison which the botulinus bacteria produce is volatile and is driven out of the food when it is boiled. It is this poison, and not the bacteria themselves, which is harmful to us.

All canned goods have a better flavor if they are opened half an hour or so before they are used and allowed to air. Peas and beans may be drained from the liquid in which they are packed, and washed by having fresh water poured through them. To prevent waste of material, the liquid may be added to soup.

All commercially canned goods are guaranteed by the manufacturer. This means that if you find a can with the contents in poor condition, and return it to the store at which it was purchased, your money will be refunded.

The Department of Agriculture does not recommend that beets, carrots, mature lima beans, pumpkins, and squash be canned. It is better to store root crops and winter squash and to dry lima beans.

References

Conn. "Bacteria, Yeasts, and Molds in the Home." Section on Bacteria and Yeasts.

U. S. Dept. of Agriculture.

Miscellaneous Circular No. 24. "Time Table for Home Canning of Fruits and Vegetables."

Farmers' Bulletin No. 1211. "Home Canning of Fruits and Vegetables."

Questions

1. Describe the two methods of canning.
2. Why may either be used for canning fruits, but only one for canning vegetables?
3. Why should you test the jars before using them? What use may be made of a jar that leaks?

4. Describe the different microörganisms that must be killed in canning. How do these differ from our garden plants?

5. State all the precautions that should be taken in inspecting a jar of canned goods before it is used.

6. Why is it better to store such vegetables as beets, carrots, and squash instead of canning them?

Home Work

Manufacturers of commercial canned goods usually put out at least three grades of material. The highest-priced goods will be carefully selected. For example, in the case of peas, the highest-priced brands will contain small peas, all approximately the same size. In fruits, the largest-sized and best-colored will be used. A middle grade may be just as good from the standpoint of taste. The lowest grade is usually made from inferior material. Each of these grades has a name of its own given it by each manufacturer. This is the reason why we must learn the names of the brands of goods that we wish to buy, if we want to be sure of getting the same grade of goods the next time. Besides this, the same material may be canned in different-size tins; but since the weight of the contents must be given on the label, we can tell by reading that just how much we are buying.

How much do the ordinary-sized cans of different vegetables contain? Go to a store where you can see several sizes of the same grade of a given food. Find out how much each size costs. Is it a better bargain to buy one size than another? Report at school what you succeed in finding out. See if you can learn to recognize different-sized cans at sight. There are two shapes of Number 1 cans. Sizes 1, 2, $2\frac{1}{2}$, and 3 are all common. Perhaps some grocer can show you a Number 10. Why does a family not often buy this size? See if you can find out what kind of materials are usually packed in the various sizes.

IV

JELLY-MAKING

Currant and Grape Jelly
Score Card for Jelly

A. Trial Jelly.

Place in saucepans one-half cup of crab apples and one-half cup of pears or peaches, cutting them into pieces. Just cover with water, later adding more if necessary. Cover and boil, until fruit is soft and will mash easily. Make a jelly bag out of double cheesecloth by folding and sewing it in the shape of a cornucopia; and, when the fruit is done, allow it to drip through the bag, at first without squeezing. Examine juice, then squeeze the remainder through and note the difference.

1. Place in glass cups one teaspoon of each juice obtained, and add an equal amount of alcohol. Let it stand five minutes. Observe the pectin, the substance which furnishes the thickening for jelly. Compare the amounts found.
2. Now try to make jelly out of the rest of the two extracts by adding to each an amount of sugar equal to three-fourths of the amount of the juice and boiling until it is determined whether the mixture will "jell."

Test for jellying:

A safe and quick test to determine whether the mixture is cooked sufficiently is to allow a little of it to drop from

JELLY BAG ON STAND

the spoon. When the mixture is done, it should be thick enough to form two drops side by side on the edge of the

spoon. These drops will run together and drop as one mass. Do not cook the mixture after this point is reached.

B. To Make Jelly.

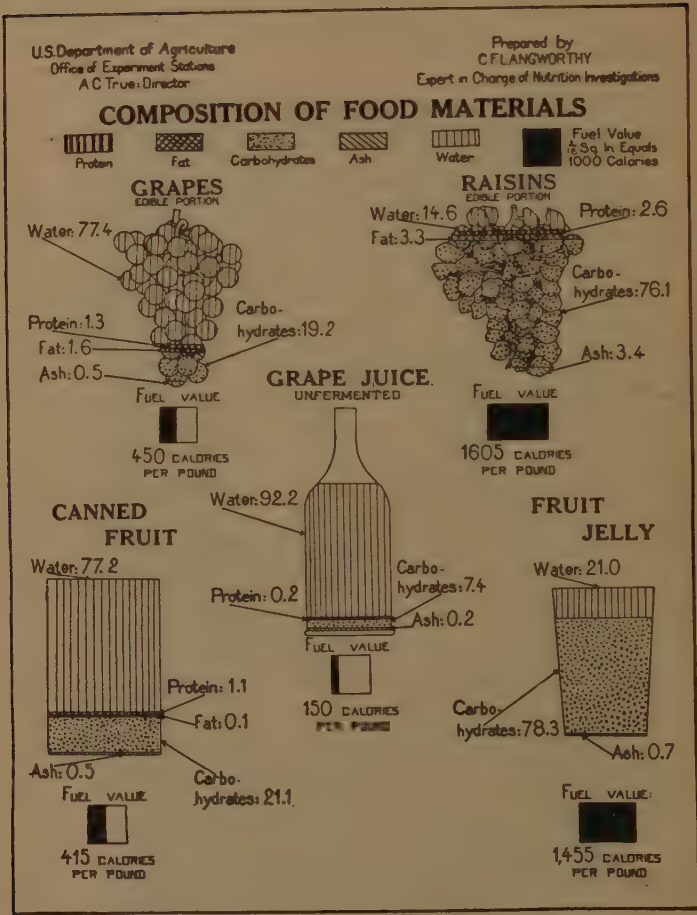
From a soft, juicy fruit.

Make grape or currant jelly. Pick over the fruit (currants need not be stemmed), wash it thoroughly, and place it in a saucepan. Add exactly half as much water as you have fruit. (While it is not necessary to add water to a juicy fruit, you will obtain more jelly if you do.) Boil the fruit until the skins have burst and the fruit is soft, then press the juice through one thickness of wet cheesecloth, squeezing out all of it that you can. Put the juice on again to heat it again to boiling, and then strain it through a jelly bag made of flannel or through two thicknesses of fine cheesecloth. Dip the bag in boiling water before you use it. This time let the juice drip through without squeezing. Measure the juice, add three-fourths as much sugar, and boil together until you can get the jellying test. Remove the mixture from the stove, skim off any foam, and pour the clear liquid into glasses which have been sterilized by boiling in water for at least five minutes. These glasses should stand in a pan of hot water while they are being filled.

Principles of Jelly-Making

Perfect Jelly

Because fruit juices differ so much in their composition, it is difficult to be sure of always obtaining perfect jelly. In fact, perfect jelly is rather seldom made. To be ideal,



COMPOSITION OF FRUITS AND FRUIT PRODUCTS

it should be not only beautifully colored and transparent, but so tender that it cuts easily and firm enough to keep its shape, but not so firm that it does not quiver.

Substances Necessary to Make Jelly

In order to make jelly, fruit juices must contain two substances, acid and pectin, and these must be present in proper proportion. When acid fruits are cooked, pectin is formed from some substance which is present in the raw fruit. This pectin is the substance which gives texture to our jellies. Curiously enough, if we cook the juice after we have obtained the pectin, it changes into something else; so when the jellying test is once obtained we must stop cooking the jelly at once.

It is possible to make jelly by very long boiling without the addition of any sugar at all to the fruit juice, but the jelly that is formed is tough and gummy and not palatable, as well as being much less in amount than is produced ordinarily. The addition of sugar in the presence of the right amount of acid seems to precipitate the pectin and make the jelly set.

Not only does one fruit differ from another in the amount of acid and pectin which it contains, but different lots of the same kind of fruit may differ materially. As fruit ripens it contains less acid, and less pectin as well, and over-ripe fruit may fail to jelly at all. Fruit that is not fully ripe is much safer to use than that which is over-ripe. Some fruits contain too much acid, unless they are diluted with water, but it is quite possible to add so much water that there is neither enough pectin nor enough acid present. The amount of acidity can, perhaps, be as well judged by taste as in any other way. Before the sugar is added, the fruit juice should taste distinctly tart.

Jelly can be made from fruits that are lacking in acid by the addition of some acid of vegetable origin, such as lemon juice or a little citric acid. This does not always improve the flavor. The acid is commonly added by stewing with such fruits some other fruit which will supply the lacking acid, as sour apples with quinces.

The alcohol test may be depended upon to tell whether the proper concentration of pectin is present. Sometimes jelly is made from a fruit juice lacking in pectin by the addition of a fruit juice rich in it. It is possible now to buy commercial pectin to add to fruit juices, but this seems a rather expensive method of making jelly.

How Much Sugar to Use

The amount of sugar used, like the water, varies with the kind of fruit. It is better to err on the side of using too little rather than too much. Jelly made from currants and grapes that are rather green may have as much as one part of sugar to one part of juice, but in general three-quarters of the amount of the juice is the right proportion of sugar. If at any time the alcohol test does not show plenty of pectin, lessen the amount of sugar. Too much sugar not only will give a jelly which is very sweet, but may give one that is syrupy or one in which, on standing, the sugar will form large crystals.

Make Jelly Quickly

The time necessary for making jelly differs with different fruits, with the amounts of pectin and acid present, and with the proportion of sugar used. The jelly, however, should be made as quickly as possible. If the fruit is allowed to simmer, too long heating of the pectin with the acid may entirely destroy this substance. For this reason

in making larger quantities of jelly the sugar is sometimes heated before it is added to the juice; if it cools off the mixture, the whole must be cooked a longer time.

Partly for this reason and partly because there is danger of burning if too much fruit is cooked at once, it is wise not to try to make at one time more than six or eight glasses of jelly. Moreover, jelly is likely to be darker and to have a less desirable flavor if it is made in too large amounts.

When the Jelly Is Made

After the glasses are filled, they should be covered with a clean cloth or a piece of paper and allowed to stand for at least twenty-four hours. Then melt some paraffin and pour it over the cold jelly until there is a layer of it about a quarter of an inch deep. The paraffin should be hot, so as to kill any germs which may be present. If, in cooling, the paraffin shrinks from the side, leaving a crack between it and the glass, more paraffin should be poured in.

Jelly keeps best in a cool, dry place. Since the color of fruit sometimes fades, it is well to keep jellies and fruits where they are not exposed to too much light.

References

Cornell Reading Course for the Farm Home. Vol. 1, No. 15. "Principles of Jelly-Making."

U. S. Farmers' Bulletin No. 1211. "Home Canning of Fruits and Vegetables."

Questions

1. In making jelly why must one be careful not to cook the juice too long?
2. What is the result of using too much sugar in making jelly?
3. Why should jelly bags be dipped into hot water before being used?

4. Why are jelly glasses put in hot water, or on a cloth wet in hot water, before filling?

5. Why, in jelly-making, is fruit not quite ripe preferred to fruit over-ripe?

6. Why is jelly covered after making?

7. Where is it best to store jelly for keeping? Why?

Home Work

1. Calculate the cost of a glass of the jelly which you made. At a grocery store, find the cost of the same amount of the same kind of jelly and compare the two. Do not forget to count in the cost of the paraffin and the glass. Which jelly tastes best? Taking into account the time it takes to make jelly, do you consider it worth the trouble to make it instead of buying it?

2. Make a list of the combinations of fruits that you think would make good jelly.

3. Make at least one glass of jelly at home. Then take it to school and ask your teacher to help you "score" it, using the form given on the next page.

SCORE CARD FOR JELLY

[From U. S. Dept. of Agriculture]

Points	Perfect Score	Actual Score
1. Package: Glasses of good shape, suitable size, tops clean, tight, free from tarnish; paraffin layer (if any) smooth, no bubbles nor breaks; labels suitable, attractive . .	5	....
2. Color: Color natural, as determined by the fruit used, no artificial coloring except for mint jelly. Color deepened by wise use of sugar and other sweetener, not darkened by over-cooking	10	....
3. Clearness: Transparent or translucent, not cloudy nor containing pulpy particles. No bubbles nor visible crystals. No mold nor signs of fermentation. No scum nor bubbles at top	10	....
4. Texture (judged after glass is opened): Jelly should hold its shape when turned out on a plate; yet should quiver when plate is moved. Should cut easily with spoon, be tender, yet break with sharp cleavage line, and show sparkling faces. Not sticky, tough, gummy, nor brittle; not syrupy; no crystals that can be perceived on tongue . . .	40	....
5. Flavor: Attractive, pronounced fruity flavor, yet not too sour; nor yet over sweet; not caramelized, nor scorched	35	
Total	100	....

V

JELLY-MAKING (*continued*)

Apple and Quince Jelly
Mint Jelly

Carry out either *A* and *B* or *C* and *D*.

A. Repeated Extractions of Juice for Jelly-Making.

Most housekeepers do not realize that if fruit is allowed to drip and is not squeezed through the jelly bag, the pulp may be returned to the kettle and boiled with more water, which gives additional extractions. The last should be concentrated until the alcohol test shows the right proportion of pectin. The first extract is usually made into jelly by itself, because it has the finest flavor, while the subsequent extractions are worked up together. If the pulp is not extracted more than once, it should be made into fruit butter or marmalade. See *D*.

Use sour apples or quinces.

1. Cut fruit in small pieces, without peeling or removing seeds. Place one cup of fruit in a kettle, cover with water, and cook until the fruit can be mashed easily. Strain juice through a jelly bag, allowing it to drip though without squeezing the bag. Reserve the

pulp for a second extraction. Test one teaspoon of the juice for pectin. Keep the juice for jelly-making, marking it "Extraction I."

2. Add water to the pulp reserved in (1) and proceed as before. Test one teaspoon of the juice for pectin. Reserve the rest of the juice, Extraction II, for jelly-making.
3. Make a third extraction. Again test one teaspoon for pectin. Reserve this third extraction for jelly-making.

B. JELLY FROM THESE EXTRACTIONS.

1. Make jelly from Extraction I, using:
   a. Three-fourths as much sugar as juice.
   b. Equal parts of sugar and juice.
2. Boil Extractions II and III together rapidly, until the resulting juice approximates the richness of Extraction I. (This may be tested by alcohol, by the color and taste.) Measure. Make jelly, using proportion of sugar to juice that is found to give the best results.

C. JELLY-MAKING WITH HARD FRUIT. APPLE JELLY.

Make jelly from tart apples, or from a mixture of equal parts of apples and quinces, or from apples and cranberries using one-half cup of cranberries to six apples.

Wash the apples and cut them into quarters, removing the stems and "blossoms" and any bad places, but do not pare or core. Measure the apples after they are cut and add an equal amount of water. Cook the fruit until it is very soft. Make into jelly, following the directions for making grape jelly (Chapter IV), but merely let the juice drip from the apple pulp and do not squeeze it.

D. Fruit Butter from the Pulp Left after Making Jelly.

Rub the apple pulp through a sieve to remove the skin and seeds, and add about half as much other fruit (berries or rhubarb will answer) to give the pulp more flavor. Measure the combination and add about two-thirds as much sugar, and a sprinkling of clove and cinnamon. Cook the mixture until it is about as thick as apple sauce. If you wish to keep it for some time, put it into sterilized jars and either seal it as you would jelly or put it in wide-mouthed bottles, cork them, and dip the top of the bottles into melted paraffin.

E. **Class Experiments.** Food Preservatives.

Sterilize small bottles or test tubes.

1. Place a piece of uncooked fruit in each.
   a. Cover fruit with brine.
   b. Cover fruit with sugar.
   c. Cover fruit with a ten-per-cent solution of sugar in water.
   d. Cover fruit with water and add ground cinnamon, clove, or mustard.
   e. Cover fruit with vinegar.
2. Allow the tubes to stand for several days and examine from time to time until it is determined which substances act as preservatives.

F. Prepare Sweet Pickled Peaches.

½ peck peaches	1 pint vinegar
2 lbs. brown sugar	1 oz. stick cinnamon

Cloves

Scald the peaches, peel them, and stick them with three or four cloves. Cook until tender a few of them at a time,

in a syrup made by boiling together the sugar, cinnamon, and vinegar. Put in jars.

G. **Class Experiments.**

CONDITIONS FAVORING GROWTH OF MICROÖRGANISMS.

Try the following experiments, using petri dishes, or saucers covered with tumblers or sheets of glass:

1. Place a piece of bread in each of two dishes. Leave the first piece of bread dry; moisten the second piece with water. Expose both to the air for five minutes in a room where people are moving about. Cover, and keep both in a dark place (as, for example, in a cupboard) for two days, and observe the results.
2. Place a piece of bread in another dish and moisten it. Expose it for five minutes in a room when no one but yourself is present, and do not move more than you can help during the exposure. Keep this dish also in the dark for two days and compare with the second dish in (1).
3. Put pieces of bread (moistened) in four dishes, and expose all at once for five minutes in a room with people moving about.
   a. Keep the first in a warm room.
   b. Keep the second in an ice-box.
   c. Keep the third in the sunlight as much as possible.
   d. Keep the fourth in a dark, warm place.

Examine these at the end of two days. If necessary, let them stand longer. What effect has dryness or moisture, warmth or cold, light or darkness, on the growth of mold? Account for the difference in (2).

Conditions Favorable to the Growth of Microörganisms

Food

All living organisms need food, and this is just as true of microörganisms as of any others; yet they seem to be able to live a fair length of time without it. They blow around in the air or float about in water with little or no food, but under these circumstances they are not growing or reproducing and may even be in the spore state. But as soon as the organisms reach available food, they begin to multiply with wonderful rapidity.

Moisture

Besides food, all living organisms need water, and microorganisms are no exception to this rule, although they differ somewhat in regard to the amount they need. Bacteria and yeasts seem to need a good deal, for only in watery foods are they capable of much growth. Sugar and flour, for example, are much too dry for them. At least twenty-five to thirty per cent of water is necessary for any growth, and even then it will not be vigorous. On the other hand, molds require only a small percentage of moisture, so that in damp weather as dry a food as flour may become moldy, and even books and clothes may mold in a damp room. Mildew is one species of mold.

Bread is put in a bread box to keep it from getting dry, but if it is left too long it is likely to mold. Bread that is spread out and exposed to the air will probably dry without any molding at all. Possibly this is entirely due to the difference in the moisture, although it is certainly true that molds grow best in still air. Many people make the mistake of trying to keep bread crumbs in a tightly closed

tin box. If the crumbs have been dried in an oven so that they are really very dry, this may be all right, but ordinary dry bread will keep much better in an open bowl lightly covered.

Bacteria differ among themselves as to the amount of air they need. Some grow only when it is present, others only when it is absent, while some can prosper either way. The bacteria that live without air cause putrefaction and are perhaps the ones most likely to produce poisons in food. These poisons are sometimes called ptomaines and are responsible for the ptomaine poisoning that may cause serious, even fatal, illness.

Darkness

Direct sunlight rapidly kills bacteria, and any daylight at all makes them grow more slowly and less vigorously. Molds may grow in either light or darkness, but not in direct sunlight, and they too grow best in a dark place. Plenty of sun and fresh air, then, are the housekeeper's allies in the fight against microörganisms.

Warmth

Another method of checking the growth of microorganisms is by means of low temperatures. Few organisms can make any but the most feeble growth in the cold. Even rather slight differences in temperature seem to have surprisingly great effects.

Methods of Preserving Food

There are other means of preserving food, besides the use of cold temperatures. Drying evidently prevents the growth of bacteria, since they need so much water, and if this is thorough it may also prevent mold action.

Dried fruits of all kinds have long been used, as have also some dried vegetables. Lately, more kinds of dried vegetables have been put upon the market, and even desiccated soups. All these are good food, as nutritious as before drying, but they do not retain quite the original flavors, nor all their vitamins.

Foods which can be boiled and canned may be made truly sterile, and, as we have already seen, if the process is carried out properly, such materials will keep indefinitely.

In recent years, still another method of preserving food has been used. This consists in the addition of something which will at least lessen the growth of germs, if not entirely prevent it. The difficulty is to find substances which will do this and yet have no harmful effect upon the people who eat the food. Among the substances commonly used for this purpose are borax, benzoic and salicylic acids, and formalin. These are all known to be harmful if taken in large amounts, but they are believed to have comparatively little effect in small quantities. But because, if they are allowed at all, it is difficult to be sure that they will be in sufficiently small amounts, and because repeated doses possibly may cause trouble, or small doses from a number of foods combine to make a large dose, and because some people (such as young children and invalids) are more susceptible to them than others, the national pure-food law has forbidden the ordinary use of them, unless the kind and amount of any such added substance is plainly printed on the bottle or can in which the food is sold.

There are, however, some food substances which themselves have something of the preserving effect. Mixing foods with sufficient sugar protects them well from bacteria or mold growth, but not quite so well against yeasts. Raisins, dates, and figs all have so much sugar in them that

it is not necessary to add any more to insure their keeping well, when they are partially dried. Salt, too, has preservative action, and salting fish is a usual device for keeping it. Other foods, like corned beef, are kept immersed in brine — that is, in salt and water. Salted butter, too, keeps better than fresh, and perhaps that is why so little fresh butter is used in this country. Very salty foods are undoubtedly not so digestible as fresh, and the use of such foods for invalids and young children is questionable. Vinegar, sometimes reënforced by spices, is another food preservative, but pickled foods will not keep indefinitely. Many of the common spices also have some preservative power. Mince meat, if kept cool, will remain in good condition for a long period. Fruit cake, which is highly spiced, keeps well. Sausage is another food which is spiced in order to prevent spoiling. But pickled or spiced food, like that preserved in salt, is probably far less digestible than in the original form, and the too frequent use of it is to be avoided.

It is hardly necessary to say that foods of all kinds should be protected from becoming contaminated with microörganisms. Foods that cannot be washed thoroughly, or sterilized by being cooked, should not be exposed to dust and dirt or handled by dirty hands. Bread, for example, should be bought wrapped in paper, candy should be kept covered in stores and handled in scoops, and all fruits and vegetables eaten raw should be washed with the greatest care. As we shall see later, milk is such an excellent food for bacteria that special precautions must be taken to keep it clean.

One of our modern slogans is "Swat the fly." A glance at the enlarged diagram of a fly, particularly of his feet, will show why it is considered objectionable to have flies around, and especially to let them crawl over food.

Coming from infected material and filth, they may bring with them all kinds of germs. If the germs are introduced into food material, where every condition is right for reproduction, it is evident that trouble will follow. So flies must be excluded from houses as far as it is possible. Any fly that finds entrance must be killed or caught, and care must be taken not to allow a heap of manure or garbage, or other fly-breeding material, to stand long enough for the larvæ of flies to develop and escape. One kind of garbage-can acts as a fly-catcher and, placed just outside the house, may catch many flies which would otherwise find their way in. But much the easiest method of keeping free from flies is to control all possible breeding places. Other insects may, of course, also act as carriers of germs, but the fly is especially likely to bring them with him.

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Farmers' Bulletin No. 459. "House Flies."

Department Circular No. 254. "Home-made Apple and Citrus Pectin Extracts and their Use in Jelly-Making."

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Journal of Home Economics, Vol. 3, p. 452. "Preservative Action of Spices."

Questions

1. What kinds of food need not be kept in a cool place?
2. Why is drying a means of preserving fruits and vegetables?
3. Why should milk and butter be covered when in the refrigerator and, if possible, be kept in a compartment by themselves?
4. Why must a bread box be frequently scalded? Why must it be perfectly dry before bread is put into it?
5. How must an ice-box be taken care of?
6. Why should our hands be washed before we begin to cook?

7. Is it necessary to wash our hands before we go to the table to eat a meal?

8. Why is it important that dishes be thoroughly washed, and dish-towels kept clean and dry?

Home Work

1. Examine your ice-box at home. Does the drain pull apart for cleaning? Do any of the walls pull out? Is it most important to keep the inside or the outside of it clean? Learn how to wash it out. How often does this have to be done? Will it help keep the box in good condition if anything that is spilled in it is wiped up immediately? If possible, put a thermometer in the ice-box when it is full of ice and see how cold the box really is. Try the thermometer in different parts of the box and see where it is coldest. What foods will you keep in those places? If you do not have an ice-box at home, how do you keep your food? (For suggestions see Farmers' Bulletin No. 1374, "Care of Food in the Home.") Take charge of the ice-box either at home or at school for at least a week.

2. Possibly you would like to make a glass or two of mint jelly.

Mint Jelly.

This is usually apple jelly with a little commercial green coloring added. Just before the jelly is taken from the stove, stir in a few stalks of mint with the leaves still on and then remove them in about three minutes, add the green coloring, and, if the apples are not very sour, a little lemon juice.

VI

USE OF WATER IN COOKING

Boiled Potatoes
Mashed Potatoes
Baked and Stuffed Potatoes

A. Various Methods of Boiling Potatoes.

(Each student is to try one way and compare the result with the others.)

1. Wash and scrub a potato. Cook it in boiling salted water until it is soft. Allow one teaspoon of salt to one quart of water.
2. Boil a potato as directed in (1), but pare it before boiling.
3. Boil a potato as in (1), but, before boiling, cut off a strip of the skin all around the potato.

How do these potatoes differ in color and in mealiness, after they are done?

Mash the potato with a fork. Beat till light and creamy. Add two teaspoons of hot milk, one-half teaspoon of butter, and season with salt, while beating. Heap the potato on a buttered plate and make an indentation in the middle of the heap. Open an egg, being careful not to break the yolk, slip it into the indentation in the potato, and place all in an oven

until the egg is cooked sufficiently to suit taste. Season egg with a very little butter, salt, and pepper. Pimento may be rubbed through a strainer and beaten into the potato at the beginning to add color and flavor.

B. **Class Experiments.** Composition of a Potato.

(To be carried out while the potatoes are boiling.)

1. Pare a small potato; cut off a slice and leave it exposed to the air for half an hour.
2. Grate the rest of the potato into a piece of cheesecloth. Gather up the corners of the cloth and, by squeezing, press out all the liquid possible. Then wash in a bowl of water till nothing more can be extracted. Allow the water to stand, and examine the sediment. Look at it under the microscope. Boil a portion of it. Does it thicken? Cool and add a drop or two of iodine. A blue color indicates the presence of starch.
3. Examine the contents of the cheesecloth. What ingredients of potato have you found so far?
4. Put a pared potato into a large kettle of cold water, and then put the kettle on to boil. When the potato is cooked, compare it with those started in boiling water in (*A*).

C. **Class Experiment.**

Different Stages in the Heating of Water.

Heat some water in a saucepan to boiling; meanwhile, with a thermometer, take the temperature of the water at the following stages:

1. When the first small bubbles appear on the bottom and sides of the pan. (What are these bubbles?)

2. When the water feels neither hot nor cold to the hand. (Lukewarm)
3. When somewhat larger bubbles appear around the edges and at the bottom of the pan. (Scalding) What are these bubbles?
4. When the bubbles begin to rise. (Simmering)
5. When the bubbles rise rapidly, breaking, and completely agitating the surface of the water. (Boiling)
6. Increase the heat and see if the water gets hotter.

Potatoes

History and Importance

The name potato is a corruption of the last part of the Latin name for sweet potatoes, *ipomœa batata*, but the name by common consent is given to our white potato. White potatoes are a native of America, perhaps of Chile, and were not known in Europe until about 1580. They were introduced into North America about the same time. At first, they did not meet with great favor in Europe, and it was not until there was shortage in a series of staple crops that they sprang into favor. Now they have been adopted in Ireland to such an extent that they form a large part of the food of the people, and for that reason are often called Irish potatoes.

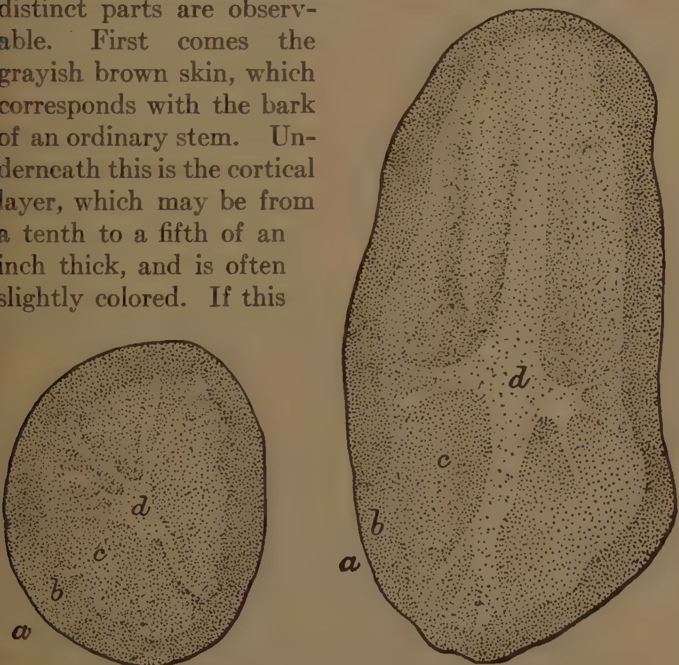
Potatoes form forty per cent of the total vegetable crop of the world, so that their name of king of vegetables is not undeserved, and they are commercially next in importance among the vegetable products to cereals. When we compare these facts with the report that at the time of our American Revolution a well-to-do family thought itself fortunate if it had at most a barrel of potatoes for its winter supply, and that these were only served on special occasions and for honored guests, we can see how greatly

the relative importance of the position of the potato has changed.

The potato is a tuber, that is, an underground stem which is thickened and has become a storehouse for future plants. The eyes of the potato are buds from which the new plants will sprout under proper conditions. These new plants in growing use the food material which is stored in the potato.

Structure

If a thin slice across a potato is held up to the light, four distinct parts are observable. First comes the grayish brown skin, which corresponds with the bark of an ordinary stem. Underneath this is the cortical layer, which may be from a tenth to a fifth of an inch thick, and is often slightly colored. If this



SECTIONS OF THE POTATO

a, skin; *b*, cortical layer; *c*, outer medullary layer; *d*, inner medullary layer.

layer is exposed to sunlight for some time, it will turn green, showing its relation to the green layer which is found underneath the bark of an ordinary stem. The inner layers are known as the flesh of the potato and, for our purpose, may be considered as one. The potato is made up of a network of cells, the cell walls being largely cellulose, as this substance is called. If possible, look at these cells under a microscope.

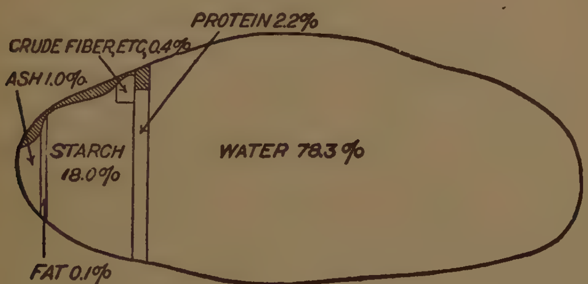
Composition

If you will compare the composition of potatoes with the list of foodstuffs that our bodies need, you will understand why potatoes are such an important food.

Foodstuffs Needed by Our Bodies

1. **Proteins** — foodstuffs containing nitrogen are essential for building up our body tissues, which are also composed of proteins. These substances may also furnish us with energy.
2. **Carbohydrates** — mostly starch, sugar, and cellulose. Sugar and starch furnish energy. We digest little cellulose, but it adds bulk to our food and tends to make it less constipating.
3. **Fats** — also producers of energy.
4. **Water** — needed by our bodies for many purposes, as we shall see in the next lesson.
5. **Mineral substances** — needed not only for building bones, teeth, and so forth, but also for regulating all kinds of processes in the body.
6. **Vitamins** — substances which influence the growth and health of our bodies. They have already been mentioned in the discussion about fruit.

All these substances occur in potatoes, although some of them are present only in very small amounts. The skin of the potato, and also its cell walls, are largely composed of cellulose, while the cells themselves are filled with water in which is dissolved mineral matter, a little sugar, and most of the protein which is found in the potato. In the cells and surrounded by this water are the starch grains. A little fat is present, although the amount is so small that it can hardly be considered; but the potato contains also some of all three of the different vitamins that we know most about.



Composition of the Potato

The average loss of nutrients from boiling is shown by the shading.

Potatoes contain more water than anything else, for they are nearly eighty per cent water, that is, more than three-quarters of their whole weight. It certainly does not seem as if there were so much water present, especially when they are cooked, but that is because the starch and cellulose absorb much of the water while they are cooking. Have you ever noticed the steam coming from a hot baked potato just after you have broken it open? About sixteen per cent of starch is found in potatoes and less than half of one per cent of cellulose. That must mean that the cell

walls are very thin indeed. There is only a little over two per cent of protein in the potato, but even that amount is of some importance; but of more importance is the one per cent of mineral matter, for few of our foods have much more and many have far less or none at all.

Besides the substances already mentioned, there is also a trace of solanin, a poisonous substance which may occur in greater or less amounts and which is said to give the characteristic flavor to the potato. This trace of solanin is supposed to be volatilized during the cooking of the vegetable, and so it is improbable that we ever eat more than a trace of it. If the potato is old and has been allowed to sprout, if it is unripe, or if it has been grown too near the surface and so has a decidedly green color, it may contain sufficient solanin to cause some digestive disturbance. Instances of this, however, are probably very rare. A fear of it makes us careful to cut away the flesh immediately around the sprout in an old potato. Care should also be taken to prevent sprouting, not only for this reason, but because the sprouts use up the food material in the tuber. Potatoes, then, should be stored in a dark, dry, cool place, and should be protected against freezing. A potato that has been frozen has a sweetish taste and is never so mealy as a good potato.

Precautions in Cooking

Potatoes are sold both by measure and by weight, but in many places dealers are now required to sell by weight, because that gives a more uniform amount to the customer. Potatoes should run fifteen pounds to a peck. In selecting, those of medium size and with a smooth skin should be chosen. A large potato is more liable to break up in cooking, and a small one means too much trouble in preparation if it is to be pared.

In preparing potatoes for the table, they should first be washed and then scrubbed with a small brush. If they are to be boiled, they may or may not be pared before cooking. If they are pared and then exposed to the air for any length of time, they will turn dark, owing to the action of oxygen, together with a ferment which is found in the potato. This can be prevented by dropping the potatoes into cold water, which excludes the air. Soaking, however, should be avoided, for it removes some of the food material, which means loss of nutriment, and is only permissible if the potato is rather old, wizened, or inferior. In that case, the product is so much improved by the soaking that we are justified, even though some food value is lost. Since the cortical layer, just under the skin, contains a higher percentage of both the protein and mineral salts than the rest of the potato, unless paring is carefully done we lose a large part of the most valuable ingredients. If much fruit and salad vegetables are included in the diet, it may not be necessary to consider the loss of mineral salts; but if it is desired to preserve them, the potato should be cooked in its jacket. This means that the potato is not quite so white, but there is no special reason why a perfectly white potato should be demanded.

If potatoes are put on in cold water to boil, the same effect as soaking is obtained. Most of the mineral matter and protein and some of the starch are lost. If, instead, the potatoes are placed in boiling water, the protein is coagulated quickly and less of it escapes. Most of the mineral salts are still dissolved by the water and so lost, since potato water has rather too strong and disagreeable a flavor to be palatable and is usually thrown away. Potatoes may be steamed with little loss of nutriment, or baked, in which case practically nothing is lost but water. Potatoes are cooked partly to hydrate the starch, and

partly because the expansion of water into steam means the breaking of the cellulose walls of the cells, whereby the contents become more readily digestible. Probably the chief reason is the improvement of flavor.

Potatoes are distinguished as mealy, soggy, and waxy. Most people prefer a mealy potato. This quality in the vegetable is supposed to be due to the amount and distribution of the starch. If, however, in cooking, the steam in a potato is allowed to condense to water, the potato becomes soggy. For this reason potatoes should never be allowed to cease boiling while they are cooking; they should be dried out as completely as possible when they are done, and served in an uncovered dish. Baked potatoes should be pricked with a fork or opened at once when they are done. Some potatoes are naturally soggy, but a good potato can be made so by poor handling in its preparation for the table. New potatoes are much more waxy than older ones, owing, perhaps, to the larger amount of protein present.

Since potatoes contain a small amount of cellulose, compared with most other vegetables, they are digestible, and there is comparatively little difference in their digestibility as a result of different ways of cooking. A mealy potato seems to be more digestible than a soggy or waxy one, probably because it is better broken up, and so the digestive juices can get at it better.

Sweet Potatoes

Sweet potatoes differ botanically from white in that they are thickened roots instead of stems. Chemically, they contain about nine per cent less water, and more carbohydrate. Most of this additional carbohydrate is sugar, which accounts for the sweet taste. Sweet potatoes grown in different regions vary greatly in the amount of

sugar, those grown in the South containing a larger percentage than those in the North. There is so little difference in food value between sweet and white potatoes that they may be substituted for one another in the diet.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 468. "Potatoes, Sweet Potatoes, and Other Starchy Roots as Food."

Questions

1. Why should not potatoes be tightly covered while boiling?
2. How should they be cared for when done?
3. Why are new potatoes more often cooked in their skins or jackets than old potatoes?
4. Is it fairer to sell potatoes by weight or measure? Would a bushel of very large potatoes or of very small potatoes give the purchaser most for his money?
5. How should potatoes be kept to prevent sprouting? What harm does the sprout do the potato?
6. Are old or new potatoes considered more digestible? Why?
7. If you are going to use the potato mashed, what is the advantage of cutting the potato into slices before cooking? What is the disadvantage?
8. Why should potatoes be pared as thinly as possible without too great waste of time? Where do the mineral salts in potatoes lie?
9. If the potatoes you wish to boil together are not all one size, what will you do?
10. Compare the temperature you obtained for boiling water with the temperatures to be obtained at sea level, and on high mountains. Explain the variations.

Home Work

1. In your store are potatoes sold by the weight or measure? What is the usual cost? How many ordinary potatoes are there in a pound? How much do the potatoes for a meal for your family cost? When do new potatoes

come into market? When do they become cheap enough for common use?

2. Bake some potatoes for dinner. If you wish, you can then "stuff" them. These are sometimes called "Potatoes on the Half-shell."

Baked and Stuffed Potatoes.

Wash the potatoes thoroughly, scrubbing them well with a vegetable brush. Bake them in a rather hot oven until they are soft. Cut a piece off the top of each and remove the contents with a fork, taking care not to break the skin. Mash the potato with a little butter, salt, and pepper, and moisten with hot milk. Use about two tablespoons of butter, three of milk, and one teaspoon of salt for five or six potatoes. Pack the mashed potato into the skins again, put them in a pan, and reheat them in the oven until they are slightly brown on top.

VII

USE OF WATER IN COOKING

Boiled Eggs
Stuffed Eggs
Scrambled Eggs

A. **Class Experiments.** Eggs.

1. Weigh out a pound of eggs. How many average-sized eggs in a pound? Repeat with small eggs. With large eggs. Would it be fairer to sell eggs by the pound instead of by the dozen?
2. Boil an egg in a strong solution of cochineal for half an hour. Break open and examine. What property of the shell is shown? What problem does this present in the care of eggs?
3. Tests for freshness.
   a. Place eggs in a ten per cent salt solution. What is the relation of the freshness of an egg to its specific gravity?
   b. Roll up a large sheet of paper into a cylinder. Place an egg in one end and look through the other end. Hold in front of a strong light. What may a dark appearance indicate?
   c. Note the feeling of the shell, rough or smooth.

d. Shake various eggs.

Are all these tests reliable with cold-storage eggs?

B. **Class Experiments.**

COOKING TEMPERATURE OF WHITE OF EGG.

1. Put a little white of an egg into a test tube and immerse the test tube in cool water above the level of the egg inside. Hold a thermometer in the egg white, and heat the water gradually, watching the egg carefully. As soon as it becomes opaque remove the tube from the water and note the temperature. Try some of the egg, and notice how tender it is. Replace the test tube with the rest of the egg white and heat as long as the temperature rises. Remove and compare with the first.
2. Cook an egg in boiling water for three minutes. Cook another by keeping it five minutes in water just below the boiling point (about 175° F.). Break and compare consistency.
3. Boil an egg for twenty minutes. Compare with an egg kept in water just below the boiling point for forty-five minutes.

C. **Class Experiments.** BOILING EGGS.

1. Place three eggs in three pints of boiling water. Cover closely to retain heat, but remove from flame. Remove:
   - *a.* one egg in five minutes,
   - *b.* one egg in seven minutes,
   - *c.* one egg in ten minutes.
2. Give directions for cooking correctly:
   - *a.* a soft-cooked egg,
   - *b.* a medium-cooked egg,
   - *c.* a hard-cooked egg.

D. Prepare Stuffed Eggs.

Cut hard-cooked eggs in half lengthwise, and remove the yolks without breaking the whites. Mash and season the yolks with salt and a very little mustard and paprika. Then add a quarter of a teaspoon of vinegar and an equal amount of melted butter or oil for each yolk, and shape the mixture into balls to refill the whites. Cheese or minced ham may be added to the yolks.

Water

Uses of Water in Cooking

Water exists in three states or conditions. It may be solid, in which case it is called ice; it may be liquid, and then it is really called water; or it may be a vapor, in which case it is spoken of as steam. The difference in these states is due to temperature; just as it takes heat to turn ice into water, so it takes heat to turn water into steam.

When we are cooking, we should remember that under ordinary circumstances water cannot get any hotter than its boiling point; so potatoes, for example, will not get done any faster because we keep the water boiling rapidly instead of slowly. All that we accomplish is turning more water into steam; and, if we are using a gas stove, wasting fuel. The pressure cooker is a device for retaining the steam and so increasing the pressure on the water that the water itself is actually much hotter than its usual boiling point. Food can, of course, be cooked faster in it than in the usual covered kettle, because the temperature is really higher.

On the other hand, if we are trying to boil down sugar and water into syrup, we can accomplish our purpose more quickly if we boil it rapidly, because we evaporate more of the liquid in a given time. Of course, under those cir-

cumstances, we should put the mixture into a flat, shallow pan rather than into a deep, narrow one, and boil it without a cover.

Occasionally the rapid motion in the water is itself desirable because it keeps the food from settling to the bottom of the pan and perhaps burning. This is true when we are boiling rice.

Water is used in more than one way in cooking. It may be used as a carrier of heat to the food we are cooking, as in boiling and steaming. Sometimes it acts as a carrier of flavor, as when we extract the flavor of tea or coffee. At other times the water is taken up into the food itself. In cooking rice, for example, there is much starch present but not enough to hydrate it — that is, wet it so that it can swell as the rice grain does when it cooks. This is the reason that one cannot put rice into an oven and bake it as one can a potato.

Water in the Body

When we realize that our bodies are two-thirds water, we can see at once that water must be a very important substance for us to have, even though it is not capable of furnishing us with energy. If we have water we may go without food for a good many weeks without dying, but we cannot go many days without water. For one thing, we need it to build into body substance; but water has many important functions besides this. For example: it moistens the digestive tract; makes it possible to swallow food; softens the food itself; mixes with the digestive ferments, and so enables them to act upon all parts of the food. It dissolves the food as it is digested and carries it through the lining of the digestive tract. Blood is composed largely of water, as are all the other fluids of the

body; so it is water that carries nourishment to all the different cells in the body. Also, water in the blood circulating through the body acts as a distributor of heat, and, again, the evaporation of water as perspiration helps to regulate the heat of the body. It is water, too, that dissolves and carries away the wastes of the body. But these are only some of the important functions of water. It is probable that none of the chemical and physiological changes which go on in the body can take place except in the presence of water.

The body gives off from the lungs, skin, and kidneys, under ordinary circumstances, about four and a half pints of water daily. About one-sixth of this amount is manufactured in the body through the oxidation of some of the hydrogen of the food, for, as nearly everyone knows, water is composed of the two gases, hydrogen and oxygen. But the body never breaks water up into these two gases. It is content, instead, to excrete it in the ways already mentioned. Of course, the water that is given off daily must be supplied daily. A good deal of this water is furnished by foods themselves; even our so-called solid foods like potatoes were seen to contain much water. Soups and beverages also furnish water. It is calculated that the average person needs to drink about eight glasses of liquid a day.

When to Drink Water

At one time it was considered harmful to drink water with meals, for it was feared that the water would dilute the digestive juices to such an extent that they would fail to act upon the food. This notion is still popularly believed. Recent experiments, however, were tried to determine the truth of the matter. Healthy men were fed test meals, in some cases water being given and in others

withheld. After a certain length of time, the contents of their stomachs were examined to see how fast digestion had proceeded. In every case it was discovered that digestion took place more quickly if water had been given. We know now that the taking of water at meals is beneficial, stimulating digestion and not hindering it.

What has been said is not in any way intended to imply that the washing down with water of poorly chewed food is anything but harmful. That is an entirely different question; nor is it intended to imply that the drinking of quantities of very cold water may not have a different effect from the one described. Cold stops digestion, or slows it, and too much ice water at a meal may readily have this effect.

A very good time to drink water is when we first get up in the morning. A couple of glasses then, either hot or cold as we prefer, seem to wash out the digestive system, and are beneficial in constipation.

People who wish to grow thin are often told to go without water at meal times. The reason this is an aid is not that water itself is fattening, but because less food is eaten if no liquid is taken. The same effect would be accomplished if we should in any other way lessen the amount eaten. Anyone going without water at meals should be sure to drink the needed amount of water between meals, for water is just as necessary to him as to anyone else.

Safe Water

Many of the germs which we eat with food are killed by the action of the gastric juice in our stomachs. But water runs through the stomach so rapidly that if it contains microörganisms, they are much more likely to be carried into the intestines unharmed. For this reason it is

especially important that our drinking water should be free from any harmful organisms. Great care is usually taken to keep our city water supplies pure, but in smaller places, where the people depend upon wells and streams, they are not always so well guarded. While there are many kinds of domestic filters which are supposed to remove the bacteria from the water, most of them are not reliable and, in any event, need great care. They must be sterilized frequently or the water which goes through them will be found to contain more bacteria than it did before. If there is any reason to believe that the water is dangerous, it is much safer to sterilize the water by boiling it. All that is necessary is to bring the water to boiling and then cool it. Water which has been boiled tastes flat because it contains less air dissolved in it. The palatability can be increased by pouring the water back and forth from one pitcher to another so as again to dissolve air in it.

Freezing does not sterilize water. While in cities, at least, our water usually comes from a reservoir that is carefully protected from contamination, our ice supply may come from a private pond in which the water may be quite impure. Unless it is known that the water from which the ice was made was pure, the ice itself should not be put into beverages or foods. Instead, they can be set on ice to cool. So-called artificial ice is manufactured by freezing water in large tanks, the necessary cold temperature being often obtained by the evaporation of ammonia. Such ice is as pure as the water from which it is made.

Hard and Soft Water

Water is sometimes classed as hard or soft water, sometimes as surface and ground water. Rain water and

water from streams and rivers is surface water, while wells and deep spring water is ground water. Rain water is our purest natural water if it is collected from a clean surface after the dust in the air has been washed out. Such water, however, flowing along the ground or through it, dissolves or carries along with it many different substances both organic and mineral.

Water which has much mineral substance dissolved in it is called hard; this is the water that will not lather easily with soap. Hard water is, however, of two kinds. In one case there is present a soluble lime salt which precipitates if the water is boiled. This is the water which leaves a crust on the inside of a tea kettle. It is called temporarily hard because the water itself is softer after the boiling. Water containing salts of lime and magnesium which are unaffected by the boiling is called permanently hard. Permanently hard water may, however, be softened by the addition of such chemicals as soda, ammonia, and borax. Soft water is much the best for washing and also for cooking, but is not so palatable as harder water.

References

U. S. Dept. of Agriculture. Bulletin 57. "Water Supply, Plumbing and Sewage Disposal for Country Houses."

Ogden. "Rural Hygiene."

Questions

1. What diseases are most frequently carried by water?
2. Why is the water from shallow wells often dangerous?
3. How should such wells be protected?
4. Why is deep well water usually safer?
5. How is the question of sewage disposal bound up with the question of a safe water supply?

Home Work

1. If you have a city water supply, perhaps you can visit the reservoir and learn how your water is protected. Is it chlorinated? Is it hard or soft water? Where does your ice come from? Is it made from pure water? How will this affect your use of it?

2. Some day, keep account of the amount of liquids you drink and see if you are in the habit of taking enough. How much we take is generally a matter of habit, and just because a person is not thirsty is no sign that he is getting enough water.

3. Scramble some eggs. These are appropriate for breakfast, lunch, or supper.

Scrambled Eggs.

Allow at least one egg for each person to be served. Break the eggs into a dish and beat them enough with a fork to mix the whites and yolks. Add a little salt, and pepper if you wish it. Put about a teaspoon of fat into a small frying pan or a saucepan, and when it is melted add the eggs. As the eggs cook, continually scrape them away from the bottom of the pan and do not let them get too hot. Serve at once.

If you like, you may add a tablespoon of milk or water for each egg you use, beating it with the eggs before you cook them. Scrambled eggs made in this way will be lighter and seem to be larger in amount.

VIII

USE OF WATER IN COOKING

Poached Eggs
Fried Eggs

A. **Class Experiments.** Solubility of Egg White.

1. Cut a small piece of uncooked egg white with a pair of scissors. Shake the egg white with some cold water. Filter. Has any of the egg white dissolved? Find out by testing as follows:
   a. Boil some of the filtered water. What happens?
   b. Add nitric acid to a second portion and boil. Cool, and add ammonia. Note color given.
   c. Try the effect of the acid and ammonia on some of the egg white itself. Egg white contains large amounts of protein, and protein gives the color with the acid and ammonia.
2. Repeat the experiment, but use water which is nearly boiling to shake with the egg.

B. **Class Experiments.**

The Correct Temperature for Poaching Eggs.

1. Drop one teaspoon of egg white into a pan of water which is at about 150° F.

2. Repeat, but have the water boiling hard and let it continue boiling for a moment or two.
3. Repeat, but have the water just below boiling.

Why does the egg white spread in one, and break up in another? In which is the temperature too high to give the cooked egg a good consistency?

C. Poach an Egg. From the results obtained in the previous experiment, account for the temperature of the water suggested in the following recipe. While it is desirable, the muffin ring is not essential. Serve on toast. What will happen if the water used is too cold? Too hot?

Poached or Dropped Eggs.

Have ready a shallow pan two-thirds full of boiling, salted water, allowing one-half tablespoon of salt to one quart of water. Put two or three buttered muffin rings in the water. Break each egg separately into a cup, and carefully slip into a muffin ring. The water should cover the eggs. When there is a film over the top, and the white is firm, carefully remove with a buttered skimmer to circular pieces of buttered toast, and let each person season his own egg with butter, salt, and pepper.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

Eggs

A United States government bulletin on eggs tells us that "perhaps no article of diet of animal origin is more commonly eaten in all countries or served in a greater variety of ways." But eggs are even more interesting when it is remembered that, like milk, they are a complete food intended for the sole nourishment of the young

animal. They must, of course, contain everything that is needed for growth. Let us see what the chick needs.

Composition of Eggs

Like us, the chick evidently needs plenty of water, for the edible portion of eggs is about three-fourths water, averaging about seventy-four per cent. The amount of protein present is high, fourteen and a half per cent; and this, together with the large amount of fat, ten and a half per cent, makes eggs rank with milk and meat in the diet. Notice how different eggs are from potatoes in their proportion of these ingredients. Also, eggs differ from potatoes in containing practically no carbohydrate. While the one per cent of mineral matter is the same as that found in potatoes, the mineral substances themselves are different. The amount and ideal form of the iron and phosphorus present in eggs adds to their dietetic value, and they are possibly even better building material than meat. In fact, unless we eat eggs in some form it is very difficult for us to get enough iron in our diet. (Vitamin Table, in Appendix.)

If you will compare the kinds and amounts of vitamins in eggs and potatoes you will notice that again these two foods are very different. While it is true that eggs are lacking in Vitamin C, this is a vitamin which we are not likely to have too little of, if we use some fresh food in our diet. This is the vitamin in which potatoes are rich. But eggs are an excellent source of Vitamin A, which occurs in any quantity only in certain of our foods, and which is present only in small amount in potatoes.

This nutriment is not divided evenly between the white and yolk, for the white contains more water and less protein and mineral matter than the yolk; and practically

all the fat is found in the latter, together with the Vitamin A. This highly nutritious yolk is intended to be the first source of food for the embryo chick. This embryo can usually be seen as a tiny white speck lying close to the yolk. The white of the egg is food used by the embryo at a later stage.

Digestibility of Eggs

For most people eggs are an easily and completely digested food. Sometimes an uncooked egg swallowed whole causes disturbance because it has not sufficient flavor to start the flow of the digestive juices, and since the egg is not broken up, what ferment is present cannot well get at it. A raw egg beaten up with a little milk is much less likely to cause trouble.

Eggs cooked in any way are very completely digested, and the ordinary person does not have to consider the small differences in digestibility which result from different methods of cooking, although fried eggs are really somewhat more difficult of digestion. Even hard-boiled eggs, if they are not swallowed in lumps instead of being properly masticated, can be included in the statement.

How to Tell When Eggs Are Fresh

The problem in buying eggs is to obtain them fresh, and the term "fresh" is by no means the same as "new-laid." A new-laid egg has a dull, rough shell, and the contents so completely fill the shell that they will not shake back and forth inside it. This is, of course, the most desirable grade, but often can be had only at an exorbitant price quite beyond the pocketbook of the average person.

Fortunately, cold-storage eggs can now be bought almost everywhere. As eggs do not keep long under usual conditions and as hens do not lay uniformly through-

out the year, when eggs are plentiful many of them are put into cold storage to be sold later. These eggs are quite good enough for ordinary cooking, and are often fresh enough even for scrambling or making omelets. Since the eggs have been kept some time, however, some of the water inside has evaporated and you can easily feel the contents shake around in the shell. But, if the egg is one that has been in cold storage, this does not mean that it is not fresh enough to use.

The reason that eggs do not keep indefinitely is because, like other foods, they are affected by bacteria. The shells are a partial protection, but since they are porous, bacteria can still enter and soon begin the process of decay. The earliest change is mainly one of flavor. Later, the membrane which surrounds the yolk is partially absorbed and it becomes difficult to separate the yolk from the white. A white can never be beaten stiff and dry if some of the yolk is mixed in with it. Eggs kept too long in cold storage often have whites that will not beat up properly.

Commercially the freshness of eggs is sometimes determined by "candling" them. This is a process in which each egg is held in front of a strong light and examined through a long tube. If the egg looks dark, it is not fresh.

Home Preservation of Eggs

Eggs should always be kept in a cool place and, since they are likely to absorb odors, away from strong-smelling foods. While they must be washed before use, it is better not to wash them until they are to be used, because there is a mucilaginous substance on the outside of the shell which helps to make it less porous.

The most successful method for preserving eggs at home for any length of time is by means of water glass. This

A ROOM WHERE EGGS ARE "CANDLED"

substance, which is a silicate of potassium or sodium, or a mixture of the two, can be bought for a few cents a pound as a syrupy liquid and diluted with ten times its volume of water. The water used should be pure, and so it is best to boil and cool it before using. Thirty to forty eggs can be put in a gallon jar and covered completely with the solution of water glass. You will need about two quarts of it. The jar should be covered to prevent the mixture evaporating, and then put in a cool place. Eggs laid in April, May, and June are the best to use for this purpose. This method is not only the easiest to use of all the household methods for preserving eggs, but is also the one that makes the eggs keep best and with least disagreeable flavor.

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Farmers' Bulletin No. 471. "Eggs and Their Value as Food."

Farmers' Bulletin No. 1109. "Preserving Eggs."

Bulletin No. 775. "Commercial Preservation of Eggs by Cold Storage."

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"Food Products", by H. C. Sherman. Second edition, Chap. V.

Questions

1. How can the freshness of an egg be determined before breaking?
2. Why does an egg become stale?
3. Are cold-storage eggs good food?
4. What is the best method of preserving eggs at home?
5. Why should eggs that are to be kept for some time not be washed before being put away?
6. Why must precaution be taken against putting eggs away near strong-smelling foods?
7. Why should eggs be washed before breaking?
8. What use is made of egg shells?
9. How many eggs of average size in a pound?
10. Why are eggs such valuable food?

Home Work

1. Practice poaching eggs at home until you are sure that you can take them out of the water without breaking them. If your family prefer their eggs fried, you might try frying some.

Fried Eggs.

For three or four eggs, put at least three tablespoons of fat — bacon, pork, or ham fat for choice — into a frying pan and when it is hot slip the eggs into it, being careful not to break the yolks. The eggs should be turned once during the cooking, or some of the hot fat should be dipped up in a spoon and poured over them.

2. Find out what were the maximum and minimum prices of eggs during the past year. At what season are eggs most expensive?

IX

USE OF WATER IN COOKING

Cereal Breakfast Foods

A. **Class Experiment.**

The Relation of Surface to Evaporation.

1. Put equal amounts of water into two saucepans, one much larger than the other, and heat both the same length of time, until the water in one is about half gone. Cool and measure roughly the amount of water left in each. To what, besides time, is the rate of evaporation proportional? Would you increase or decrease the amount of water to be used in cooking a small amount of cereal in a large pan?
2. Repeat the experiment, but with the saucepans closely covered. Is there any difference? Explain the result. Why is it impossible always to state the exact amount of liquid to use in cooking?

B. Prepare Cereal with Fruit.

1. Add gradually one cup of rolled oats, or three-fourths of a cup of cream of wheat or wheatena, to three cups of actively boiling water to which one teaspoon of salt has been added. The oats may be sprinkled into the water, but so finely ground a cereal as wheatena is less likely to lump if it is mixed with a

little cold water before it is stirred into the boiling water. Boil the cereal for five minutes over the direct flame, stirring constantly; then finish the cooking over hot water. Either keep the cereal covered during this second cooking or stir it occasionally to prevent a tough "skin" forming on the top, and cook it about thirty minutes. A few moments before the cereal is done, add the meat of a half-pound of dates cut very fine, or else some raisins or figs. Serve with sugar and cream.

2. Repeat (1), but use half a cup of water less; cook the cereal ten minutes over the direct flame, and finish the cooking in a fireless cooker, leaving it in the latter for five to ten hours. If necessary to reheat for serving, put it in a double boiler.

C. Crisped Cereals.

Examine and taste a "ready-to-eat" cereal as it is purchased. Place a little of it in a pan and put it for a moment in an oven; compare with the portion not heated.

D. **Class Experiments.** Cereals.

1. Test cereals for both starch and protein.

Test for starch:

Heat a grain or two of cereal in a little water, then cool it and add a drop or two of iodine. Notice the color formed. This color shows the presence of starch, but will not be given well by raw starch. Try this by putting a drop of iodine directly on a grain of cereal.

Test for protein:

Use the test given in VIII, *A*, 1.

2. Examine rice- and oat-starch under the microscope. Notice size, shape, and any apparent markings.

Cereal Breakfast Foods

The term "cereal" is used in a number of different ways. While cereals are botanically cultivated grasses, when we talk about cereals we usually mean just the seeds of these plants. Sometimes we use the term to include all of the products of cereals — such as flour and macaroni — as well as the grains themselves, and common usage often makes the word synonymous with the term "breakfast food."

Composition of Cereals

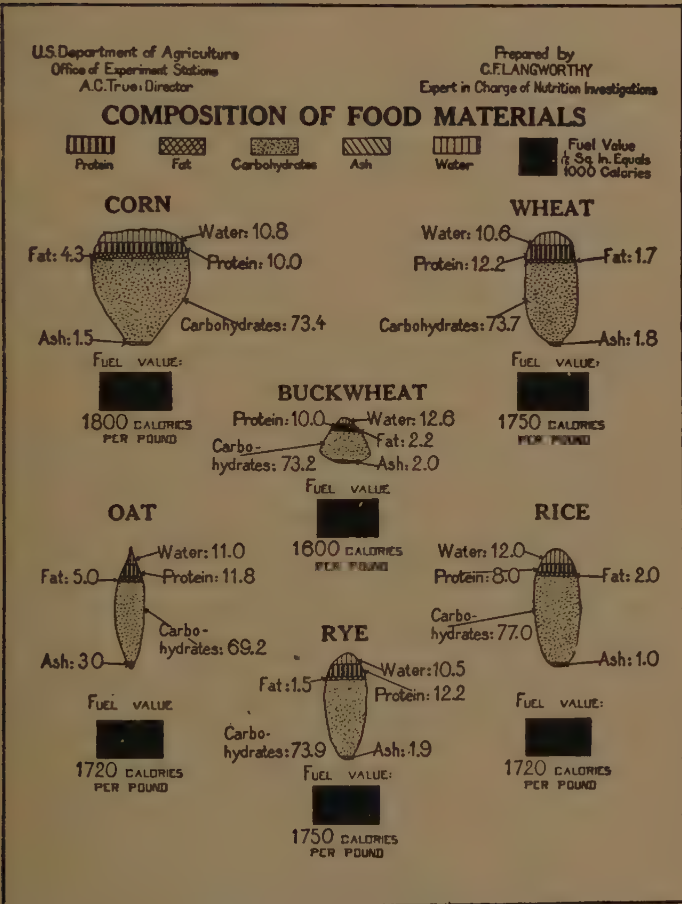
The seeds of these plants are their storehouses of food for the use of the embryo plants, just as the tuber is for the embryo potatoes, and all these cereal plants put much the same food into them. Here is what we may expect to find:

Average Composition of Cereal Grains

Water	10–12 per cent
Protein	10–12 per cent
Carbohydrates	65–75 per cent
Fat	2– 8 per cent
Mineral Matter	2 per cent

These figures are for the raw grains. Mushes and porridge contain a great deal of water. Cooked oatmeal contains about eighty-five per cent of water, but shredded wheat and the flaked breakfast foods have practically the same composition as the original grains.

Of the three grains most commonly used for breakfast foods — wheat, oats, and corn — oats furnish most protein and fat. Wheat, however, does not differ very greatly in nutritive value and contains less fiber than oats, and so is somewhat more easily digested, while corn has a tougher fiber than either of them. Rice contains very little fiber



COMPOSITION OF CEREALS

but more starch than the others, and is perhaps the most easily digested of them all. Barley and rye are occasionally used for breakfast foods but not very commonly. Although there is considerable difference in flavor between the grains, the differences in composition are comparatively small.

Cost of Breakfast Foods

The cost of breakfast foods varies somewhat with the cereal from which they are made, the cost of those made from corn being least, those from oats next, while those from wheat are the most expensive. The cost, however, differs even more with the amount of preparation that has already been made.

From the standpoint of preparation, breakfast foods may be divided into four classes. In the first are foods like oatmeal or cracked wheat, in which the grain has been husked but not cooked. Next comes the class of partially cooked foods. These have been steamed until they are somewhat softened and then, if they are to be put on the market as flakes, they are passed between hot rollers which flatten the kernels. Rolled oats is an example of this class. The third class is composed of those which are sold ready to eat, as grape nuts or shredded wheat. Sometimes malt is used in the process of manufacture and is supposed to change the starch into sugar and so start the process of digestion. In most breakfast foods which are malted, not much change in the starch will be found to have occurred, and since, for the healthy person, it is of little moment whether this change has occurred or not, this fourth class, called predigested, is not of great importance.

Foods of the first class need to be cooked a long time in order to render them thoroughly digestible. This is

more or less trouble even on a coal or wood stove, and on a gas stove is an expensive process. Cereals can, however, be easily and cheaply prepared in a fireless cooker, and if both cost and attention are to be considered, this is the method of preparation which should be chosen.

Breakfast foods which belong to the third class cost much more per pound than those in the first class, because they are more trouble to the manufacturer. Their advantage to the housewife is in the saving of time necessary to prepare the food and in the variety they give to the diet.

Many of the breakfast foods may be purchased both in bulk and package. The advantage of the package is greater surety of cleanliness. Most of the milling is carried on under excellent sanitary conditions. The package assures us that the goods have come to us in the same condition as that in which they left the mill. Bulk goods are often protected neither from dust nor insects. As, however, the uncooked cereals sold in bulk are thoroughly sterilized in cooking, this protection is far less necessary than in the case of such foods as bread, which is eaten as bought.

Since cereals do not keep indefinitely, it is better to buy them only in moderate amounts, especially in hot weather. There is often a considerable saving, however, in buying even two packages instead of one.

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Farmers' Bulletin No. 565. "Corn Meal as a Food, and Ways of Using It."

Farmers' Bulletin No. 1195. "Rice as Food."

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Questions

1. Make a list of all the kinds of grain you know.
2. How does the English use of the word "corn" differ from the American?
3. Give illustrations of the different groups of breakfast foods on the market.
    a. Uncooked grains.
    b. Partly cooked.
    c. Ready to eat.
    d. Predigested.
4. What are the advantages and disadvantages of the different groups?
5. Is the greater cost of package foods justified?
6. Why is it well to keep cereals in glass jars tightly covered?
7. Why are cereals so important as food?
8. How can the "skin" which sometimes forms on top of a cereal while it is cooking be prevented?
9. Why will soaking the grains for an hour or so beforehand shorten the needed time for cooking?
10. What are the advantages of using a fireless cooker in preparing cereals?

Home Work

1. If possible, cook some cereal breakfast foods at home. Even if your family are not regularly using them, they may like some kinds well enough to eat them if you prepare them. Perhaps they will enjoy them if you prepare them with fruit. If you do not use a fireless cooker, remember that a cereal like rolled oats cooked for an hour and a half is much more palatable than when it is cooked only half an hour. For this reason, it might be well to prepare it the night before and then merely take time to warm it up in the morning.

2. Find the price of the packages of a number of kinds of ready-to-eat cereals, as well as of some that must be cooked. Read the labels to find out the weight of the contents of each, and then calculate the cost per pound of each kind. Be sure to include one of the "puffed cereals" in your study. Compare them with the cost of such cereals as you can buy in bulk.

X

STARCH

Apple Tapioca Pudding
Boiled and Steamed Rice

A. Prepare Apple Tapioca Pudding.

$\frac{1}{4}$ c. minute tapioca	$\frac{1}{2}$ tsp. salt
$2\frac{1}{2}$ c. boiling water	6 sour apples
$\frac{1}{2}$ c. sugar	

Cook the tapioca with the salt and water in a double boiler until it is transparent (about fifteen minutes). Pare and core the apples. Put in a buttered baking dish, and fill the cavity in the apples with sugar. Pour the tapioca over it, and bake in a moderate oven until the apples are soft. Serve with sugar and cream.

B. **Class Experiments.** Rice.

Wash the rice thoroughly in a strainer in a bowl of water, rubbing the rice between the hands. Change the water, until it remains clear. Cook by the following methods:

1. Gradually sprinkle two tablespoons of rice into two cups of rapidly boiling water with one-half teaspoon of salt added.
2. Cook two tablespoons of rice in two-thirds of a cup of boiling, salted water for five minutes. Finish cooking in a double boiler. (Why is less water used?)

3. Cook two tablespoons of rice in two-thirds of a cup of boiling, salted water for five minutes. Then place in a mold and steam.
4. Put two tablespoons of rice directly into the upper part of a steamer and steam until done.

   In all cases cook until the rice is soft.

   a. Compare the time used to cook by the different methods.

   b. Compare the appearance of the kernels as a result of the different treatments.

   c. Note also the relative amounts of rice before and after cooking.

The cooked rice may be saved for use in the next lesson or made into rice cakes by mixing the rice with a little slightly beaten egg, and shaping into flat round cakes. These should be dipped into flour and sautéed in a little fat in a frying pan. Turn them as soon as they are brown.

Starch

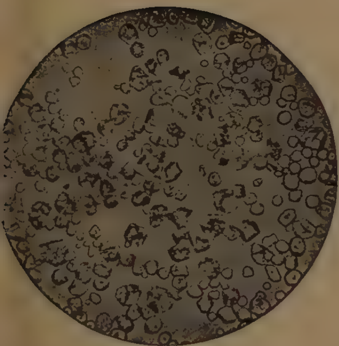
Starch occurs in the cells of all plants as tiny white granules, but the size, shape, and appearance of these differ with the kind of plant from which they are taken. If you have not already examined several under the microscope, study their appearance in the illustrations in this book.

How Plants Manufacture Starch

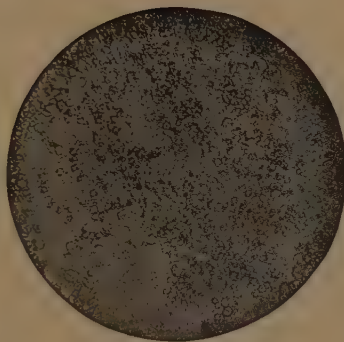
Surely no one would ever guess the materials from which plants manufacture starch. Whenever wood or coal is burned, the oxygen of the air unites with the carbon that is in these materials and forms a gas which is known as carbon dioxide. This gas is also formed by the slow burning of food that we have eaten and is given off into the air from our lungs. The air would, of course, finally

contain a great deal of this gas if it were not for the work of the plants. Fortunately all plants use the carbon from this gas for food. By means of the chlorophyll or green coloring matter in their leaves and green stems, they manage to break the gas up, returning the oxygen to the air; but using the carbon, and water which they take in through their roots, to form sugar. The sugar, dissolved in the juice or sap, circulates through the plants and serves for part of their food. However, it is the business of the plant to manufacture more sugar than it actually needs for its immediate use, and this extra amount it usually stores in some such place as tubers or roots or seeds for the future needs of young plants. Starch has the advantage over sugar that it is not soluble in water. The material is carried into the cell as a solution of sugar which can pass readily through the cell wall and is then turned into granules of starch. When the starch is finally used as the plant food, this process is reversed; the granules change into sugar again, and can then pass out through the cell wall.

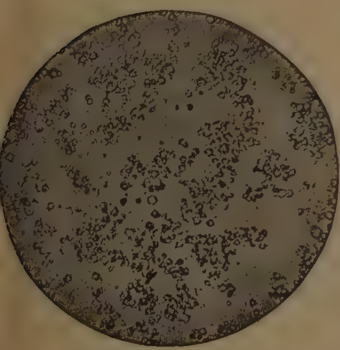
Scientists do not agree entirely in regard to the construction of starch granules, but they believe that they are made up of at least two kinds of starch which are sometimes named red and blue amylose. Amylose is merely the scientific name for starch, and the names red and blue are given to the two kinds; not at all because of their color, for they are both white, but because of the colors which they turn with iodine. The starch inside the granules and composing the greater part of the grains is blue amylose, easily digested. Its outer covering is red amylose, much more difficult of digestion and impervious to cold liquids. If the starch grain is heated in water, it begins to swell, till its outer covering is stretched thin and allows liquids to pass readily through it. In this form



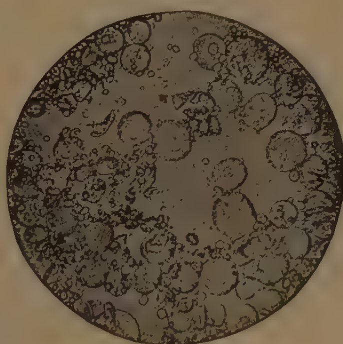
Corn Starch



Oat Starch



Rice Starch



Wheat Starch

STARCH GRAINS, MAGNIFIED MANY TIMES

'rom Leach's "Food Inspection and Analysis."

digestive juices can get at the starch inside to digest it; and, therefore, cooked starch is more digestible than raw.

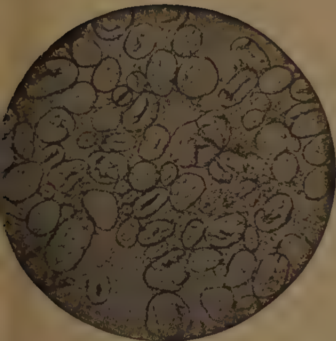
Cooking of Starch

As it seems to be rather hard to cook starch granules when they are shut up in the cell walls of the seed, this may be the reason why cereals take such a long time to cook. Corn starch is, of course, a cereal starch, and ordinary wheat flour, too, contains an abundance of starch; but in grinding the grains, the cell walls are broken and so there is not the same difficulty in getting at the starch for cooking. If, during the cooking of starch, as, for example, in the cooking of oatmeal, the surface is left exposed so that the top dries, the starch is changed into a hard skin which is exceedingly difficult of digestion. If the oatmeal is stirred occasionally and kept covered so that the steam is confined in the space above the surface, no such change occurs.

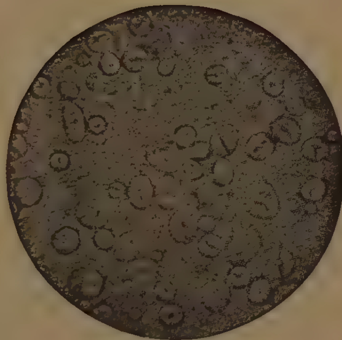
CHANGES OF STARCH GRAINS IN COOKING

a, cells and starch grains in a raw potato; *b*, in a partially cooked potato; *c*, in a thoroughly boiled potato.

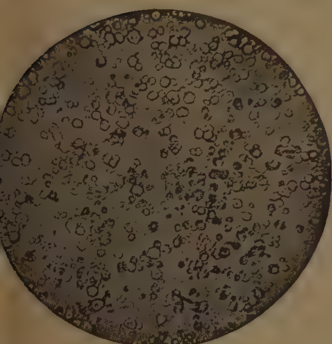
When a vegetable food containing much starch, such as potatoes or cereals, is cooked in water, the starch granules swell in the process until they burst most of the cell walls of the plant.



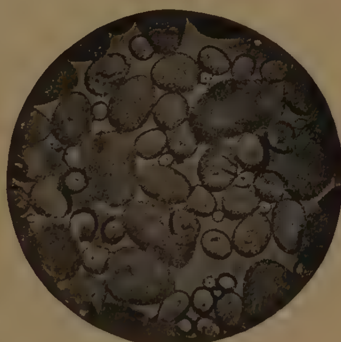
Pea Starch



Bean Starch



Buckwheat Starch



Potato Starch

STARCH GRAINS, MAGNIFIED MANY TIMES

rom Leach's "Food Inspection and Analysis."

Digestion of Starch

Raw starch is not soluble in cold water; but if it is heated with water, the starch granules break down and form a paste. This is only partial solution, for when a substance really dissolves it disappears entirely from view, just as sugar or salt does in water. It may give a color to the solution but it does not make it opaque.

Because starch does not dissolve, it cannot pass through the lining wall of the intestines and so must be changed in digestion before it can be absorbed. A ferment called ptyalin is found in the saliva, which is capable of acting on starch and changing it to sugar. Put a piece of cracker into your mouth and chew it for a long time, being careful not to swallow. After a while you begin to get the sweet taste of the sugar that is formed. There is an intermediate stage in this action, for the starch is first changed into dextrine. Dextrine is whitish like starch, but with iodine turns a beautiful wine red. Unlike starch, it is soluble in cold water.

Ordinarily when we chew starchy food, although we mix it with saliva, the ptyalin does not have time enough to bring about much change in the starch. But as the food lies in the fundus (or middle part) of the stomach the ptyalin has a chance to act on it. It used to be thought that this action stopped as soon as the food reached the stomach, for ptyalin cannot act in gastric juice; but it is now known that this change can go on for about two hours before the gastric juice is so mixed with the food that the action is stopped. Therefore it seems that such food should be chewed thoroughly and mixed with saliva, and not swallowed whole or washed down with liquids. In the stomach, however, not all of the starch is digested. Probably most of it does not go beyond the dextrine stage.

In the intestines there is another ferment — sometimes called amylopsin, which, like the ptyalin, can digest starch.

We are, then, apparently well equipped to digest starch, and this is fortunate, for starch forms a large proportion of the nutrients of our diet.

Effect of Dry Heat on Starch

Dextrine may also be formed by heating dry starch very hot, at least to 320° F. It is formed somewhat in toast, and in the crust of bread, and in browned flour, since in these cases the starch is exposed to intense heat. Some breakfast foods are partially dextrinized and this is supposed to make them more digestible. In reality, so small a percentage of the starch is changed that they are really not very different.

Browned flour does not possess the thickening power of ordinary flour because the dextrine in it dissolves instead of gelatinizing. Since heating with acids will dextrinize starch at a much lower temperature, and only a few drops of acid are necessary to bring this about, it is sometimes possible to obtain this result when it is unexpected and undesired. When a lemon filling for a pie or a boiled dressing that is made with flour are cooked too long or with too much acid, they may grow thinner instead of thicker as the cooking continues. So, also, if creamed oysters are kept hot too long a thick white sauce may become very thin.

Reference

U. S. Dept. of Agriculture. Exp. Station Bulletin No. 202. "The Digestibility of Different Kinds of Starches . . . as Affected by Cooking."

Questions

1. Where does a plant obtain the necessary elements to make starch? How does it take in water? How does it get carbon?

2. What purpose has the plant in manufacturing starch, and in what parts of plants would you expect to find the largest stores of it?

3. How is rice grown, and where do we obtain our largest supply?

4. What is the composition of rice? Why is it not used as an exclusive diet?

5. Why not bake rice as we do potatoes?

Home Work

1. Cook some rice at home in any one of the ways suggested in this lesson. It may be served in place of potato at dinner, or with sugar and milk for dessert. If the rice is boiled in water, considerable starch remains in the water and it is a good plan to use it in making soup.

2. Ordinary white or polished rice does not contain very much mineral matter, for most of it has been polished away. Unpolished rice — brownish or gray in color — is rice which has simply been husked, and contains nearly twice as much mineral matter, as well as some vitamin, which is not found in the polished variety. If the brown rice is much more expensive, it is probably not worth the higher price for us who live on mixed diets. For those of the Chinese who live mainly on fish and rice, this difference is most important. If both kinds are to be had in the stores where you deal, find out the price of each kind. See also if you can buy "broken rice." This is sold for less because the grains are no longer whole. Would this affect the food value?

XI

MINERAL SUBSTANCES

Rice and Indian Puddings

Creamy Rice Pudding

A. Prepare Rice Pudding.

Use the rice cooked in the last lesson.

2 c. cooked rice	$\frac{1}{4}$ c. sugar
1 c. milk	$\frac{1}{2}$ tsp. salt
1 egg	$\frac{1}{4}$ c. raisins

Scald the milk. Beat the egg with the salt, add sugar, and pour the scalded milk over the mixture. Put into a buttered baking dish with rice and raisins. The raisins may be omitted and a little grated rind of a lemon used; or cinnamon, ginger, or nutmeg. Molasses or maple syrup may be substituted for the sugar.

B. Prepare Indian Pudding.

5 tbsp. yellow corn meal	$\frac{1}{2}$ c. molasses
1 quart of milk or milk and water	1 tsp. salt
	1 tsp. ginger

Pour the hot milk over the meal, and cook twenty minutes in a double boiler. Add the other ingredients, and bake very slowly in a buttered dish.

C. **Class Experiment.** MINERAL ASH IN VEGETABLES. Use a piece of vegetable about as big as an inch cube, cutting it into thin slices and spreading them out in an evaporating dish (the top of a baking-powder can will serve). Heat until the residue is quite white. The process may be hastened by moistening with a drop of nitric acid, and if a blast lamp is available, use it. Note the amount of ash obtained in relation to amount of vegetable used.

CELLULOSE

Cellulose is the fiber which makes up part of the framework of plants. It has much the same chemical composition as starch and is probably manufactured by the plant out of sugar in much the same way that the starch is.

Digestion of Cellulose

Cellulose is much less easily dissolved than starch. Our foods contain only a small per cent of it and that is the tender variety, such as is found in lettuce, radishes, and asparagus. It is a form of carbohydrate that is of much less importance to mankind than to animals, for animals have ferments in their digestive tracts which are capable of digesting it, while we have no ferments with this power.

Nevertheless, the scientists find that man digests some cellulose. This is one of the beneficial acts of bacteria present in the intestines. Some of these bacteria are capable of acting on tender cellulose and changing it, perhaps into sugars and organic acids, in which forms it can be absorbed and burned as fuel to furnish the body with heat and muscular energy. Undoubtedly some of the breaking down of the cellulose proceeds further than this, and then gases are produced which have no nutritive value.

But not all forms of cellulose are easily enough broken down to have such changes occur. Cotton is a form of cellulose which would be absolutely without nutritive value. Such tender cellulose as is found in the cell walls of seeds like the cereals, and in vegetables, especially when young, is more capable of being digested. Still, it is probable that the less cellulose there is present in a vegetable food, the more digestible it is. This is probably the reason that rice is so easily digested, for it contains less cellulose than the other grains.

Effect of Cooking

Boiling in water does not change real cellulose at all, just as cotton clothes are not changed by boiling. But the cellulose cell walls of a plant are stiffened with other related substances; for one, with the substance which changes to pectin. Cooking dissolves out some of these intercellular substances and also hydrates the starch, and so cooked vegetables are softened. Then, as has already been explained, by thorough cooking the cellulose walls may be ruptured by the swelling of the starch grains within the cells and so the contents exposed without its being necessary first to digest the cell walls.

Cellulose as Roughage

Some authorities believe that inert particles like cellulose are sufficiently rough to stimulate the intestines to peristaltic action, that is, to movements which hasten the passage of food through the intestines and which are an aid in combating constipation. But, since foods are not laxative in proportion to the amount of cellulose they contain, others believe this action is due rather to the stimulus of certain salts which occur largely in the husks

of the cereal; and that it is due to the presence of these salts and not to the larger amount of cellulose in them that such articles of food as cracked wheat and graham bread are more laxative than those cereals which have undergone more extensive manufacturing processes.

Bran is largely cellulose, but it contains a good deal of mineral matter, and, as everybody knows, is a good laxative food. Perhaps the truth is that both the cellulose and the mineral salts are helpful in this respect.

Mineral Substances

Mineral substances are found in every tissue and fluid in our bodies as well as in our bones. They are present in all digestive juices and play a necessary part in the digestion and absorption of our food; they are dissolved in our blood, regulating its specific gravity and its alkalinity. They are found, too, in all body excretions; tears and perspiration are both, for example, distinctly salt. So, although they occur only in small amounts, they are of vital necessity to us, and since man excretes every day a comparatively large amount of mineral matter, this loss must be replaced. Let us see, then, what these mineral substances are and how we must plan for them in our diets.

Use of Mineral Elements in Our Bodies

The principal mineral elements in the body are calcium, magnesium, iron, sodium, potassium, phosphorus, chlorine, iodine, fluorine, silicon, and sulphur. These occur as compounds, forming both mineral and organic salts. Unlike carbohydrates, fats, and proteins, mineral salts are not changed in digestion, nor are they oxidized, and so they do not furnish the body with energy, and when organic matter is burned, these salts remain unconsumed as the ash.

Fortunately for us, however, the necessary amounts of most of these mineral substances are provided in an ordinary mixed diet. What a task it would be if we had to plan to provide some of each one! But there are four that may not be present in sufficient amount, and since these are all of the greatest importance in the part they play in the body, we shall have to consider them specially. They are calcium, iodine, iron, and phosphorus.

Calcium, often spoken of as lime, is not only necessary for strong teeth and bones, but in connection with another mineral substance is probably responsible for the contraction and relaxation of the heart muscle, making the heart beat. Iron is necessary for the formation of red blood corpuscles, and these corpuscles carry the oxygen from our lungs around into all parts of our bodies, where it is used to burn the food in the tissues. We know that we cannot live without air, but neither could we live without iron, for without it we should be wholly unable to use the air. Iron and phosphorus are both present in every active cell in our bodies, and phosphorus helps calcium in making our bones. Phosphorus is also an essential part of our brain tissue. It is quite evident that all three of these are essential to life itself. While at the present time we can say less about the part played by iodine, we know that a sufficiency of it, even though this is only a very, very small amount, is needed to prevent goiter, a disease which is troublesome in some parts of our country.

Foods Supplying These Elements

Our problem is how to obtain enough of these elements in our foods. A person who lives largely on meat, potatoes, white bread and butter, and sweet desserts will not have a diet that supplies nearly enough of them. Gen-

erous amounts of milk, eggs, vegetables, and fruits are needed to give us calcium, phosphorus, and iron. Cereals can supply some of this mineral matter if the outer coats are not removed. You will remember that we found that rice lost half its mineral content if it was polished. Of course, we must take care to prepare all our food so as not to lose its mineral content. We must be careful not to cook our vegetables in large amounts of water and then throw the water away, for much of the mineral matter is dissolved in the water during the cooking.

Getting enough iodine in food is another matter. Sea foods contain it, and formerly, when most of the salt which we used for food was manufactured by evaporating sea water, our salt usually contained enough iodine to keep us in health. Our purer salt of the present day, much of it manufactured from inland deposits, often contains no iodine at all, and as it is difficult for people in certain sections of the country to eat much sea food, there are whole regions where goiter is very common. Some communities are requiring that the salt sold there be iodized, others are introducing iodine into the water supply. However, the whole subject is still somewhat in an experimental stage. It has, however, been proved, in regions where goiter is prevalent, that if schoolgirls, who are much more likely to develop this disease than are boys, are given at regular intervals an iodine salt they are much less likely to have goiter at adolescence, the time when it most frequently appears.

How Eating Acid Fruits Helps Keep Our Bodies Alkaline

Fruits play a special part in our diet because they help to keep the body alkaline. In the metabolism of most

proteins, mineral acids are formed which the body cannot burn and which must be neutralized by such basic substances as sodium, potassium, calcium, and magnesium, in order to preserve the alkalinity of the blood. In this process fruit is our chief factor of safety.

At first thought, it seems strange that we should eat fruits to prevent over-acidity when fruits themselves are acid. The explanation is that the sourness of fruit is due partly to organic salts of such basic substances as sodium, potassium, calcium, and magnesium. The acid part of these salts the body is able to burn to carbon dioxide and water, much as it burns sugar, excreting the carbon dioxide through the lungs. This process leaves sodium, potassium, calcium, and magnesium to combine with the mineral acid coming from the combustion of protein. There are three fruits, plums, prunes and cranberries, which contain an acid which acts like the mineral acids, but so far as we know, all the other fruits act in the way that has just been described.

It is important to remember the need for generous amounts of vegetables and fruits in the diet, for these often seem expensive foods in comparison with the amount of energy and of building material which they contain, and the poor are tempted to leave them entirely out of their rations.

References

Journal of Home Economics, Vol. 4, pp. 405–412. "Losses in Boiling Vegetables."

"Feeding the Family", by M. S. Rose, pp. 21–28 and 258–262.

Questions

1. Are all mineral elements so abundant in foods that they do not need to be taken into consideration in menu-making?

2. What foods contain iron? What special use has the body for this substance?

3. What are some of the reasons why milk is so valuable a food for babies?

4. How may carelessness in preparation waste or lose the salts contained in foods?

5. Discuss the boiling, baking, and steaming of vegetables from this point of view.

6. What uses may be made of the water in which vegetables have been cooked? When is this worth while?

7. Do canned and dried vegetables retain their mineral salts?

Home Work

1. Make a rice pudding for dessert at home. You can make it out of uncooked rice by use of the following recipe:

Creamy Rice Pudding.

1 qt. of milk or milk and water	½ tsp. salt
⅓ c. rice	⅓ c. sugar

Grated rind of ½ lemon, or other flavoring if preferred.

Wash the rice and mix it with the other ingredients in a buttered baking dish. Cook very slowly in an oven for three hours, stirring it at least three times during the first hour. The stirring prevents the rice from settling to the bottom.

2. Look in the Table of Mineral Matter in the Appendix and find the five foods that furnish the most iron in a serving (the ones that need the least number of servings to furnish the total amount needed for a day), the five furnishing the most calcium, and the five furnishing the most phosphorus. Put each five in order, beginning with the one containing the most of that substance. Notice whether the same food appears in more than one list.

In "Feeding the Family" Mrs. Rose gives the five cheapest sources of calcium as cottage cheese, milk, dried

navy beans, oatmeal, and graham bread; of phosphorus, as cottage cheese, oatmeal, dried navy beans, corn meal, and dried peas; of iron, as dried navy beans, dried lima beans, oatmeal, buttermilk, and spinach. How does your list compare with these?

3. Measure a pound of rice with a measuring cup. If you were cooking rice for your family to use instead of potato for dinner, what part of a pound would you use? How much would this amount cost? How would this compare with the cost of potatoes for the meal? How would the two compare in regard to the amount of mineral matter that they would furnish?

XII

BREAKFAST

PREPARE AND SERVE A BREAKFAST.

Calculate the cost per person.

Suggested menu:

Fruit, fresh or stewed.
Cereal, cooked or ready-to-eat.
Eggs, boiled or poached.
Serve with toast or bread.
Milk.

SETTING THE TABLE

Scientists have established the fact that our state of mind when eating is an important matter, a sense of comfort and pleasure going far toward making a meal easily digested, so we should try to set our tables for meals as attractively as possible.

Making the Table Attractive

Cleanliness and order are a bigger factor in making an attractive table than are the elaborateness and cost of the table appointments. Everything on the table must be scrupulously clean, so clean that there is no question about it. It is often difficult, especially with children,

to keep all parts of a tablecloth unspotted. In that case it is well to consider the use of doilies or table runners, which may be replaced as each is soiled without greatly

From "Table Service", by Lucy G. Allen.

DIAGRAM OF BREAKFAST TABLE

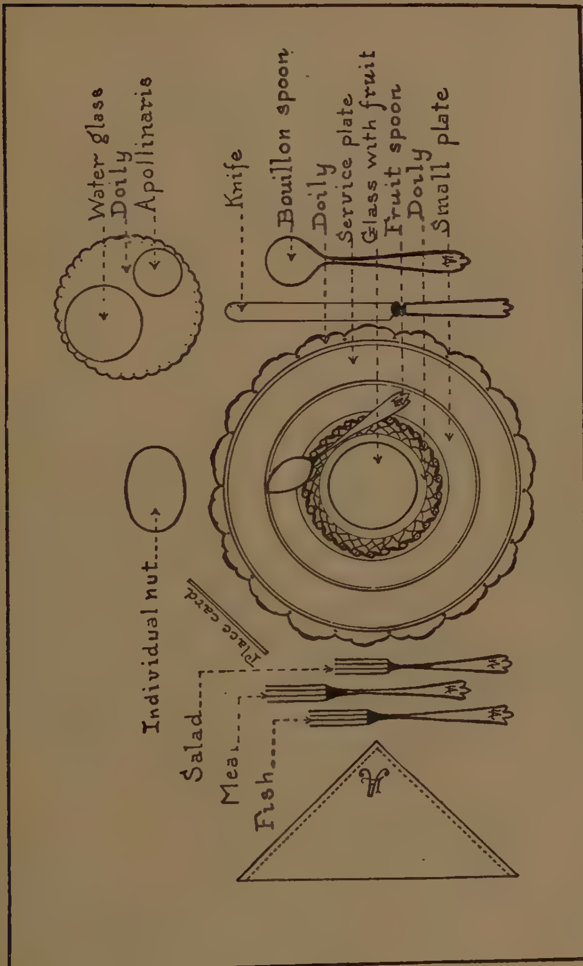
increasing the labor of washing. Sanitas doilies are very practical, for when they are soiled they need merely be wiped off with a damp cloth. Doilies are often preferred even in houses where cost and work are not a consideration, especially for the less formal meals. Often, only one fairly large doily is used at each place.

In many homes the tablecloth is not removed between meals. This is usually unfortunate, because it is seldom possible to make the cloth appear as well as when it is freshly laid. Often not all the crumbs are removed. If the housekeeper is so busy that leaving the table set is a necessary practice, at least some clean outer covering should be spread over it to keep away the dust. A "silence cloth" is not only a comfort in lessening the noise, but it helps protect the table from hot dishes. It also greatly improves the appearance of the tablecloth and keeps it from wearing out so fast against the edge of the table.

How Each "Cover" Is Laid

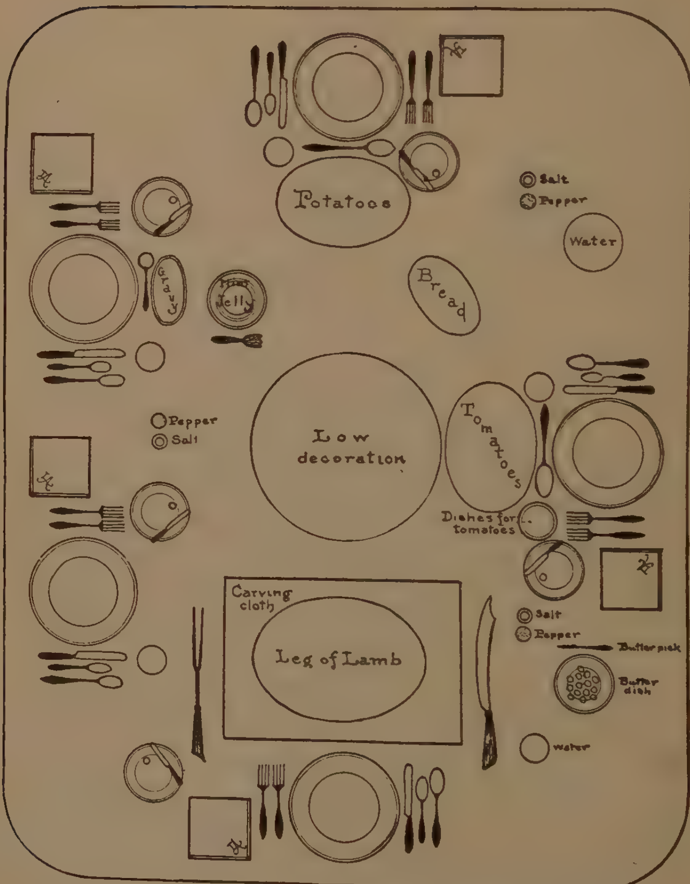
At each place the fork or forks are placed for convenience with the tines up and on the left of the plate; for the same reason the knife or knives on the right with the sharp edge toward the plate. Knives and forks should be placed at such a distance that they give neither a crowded nor a sprawled-out appearance, and are set about an inch from the edge of the table. Spoons, bowl up, are usually placed at the right of the knives; occasionally, however, they are put at the top of the knives to save room.

When much silver is to be used, the various kinds are sometimes arranged according to size; but it is better form, because less confusing, to arrange them in the order of use, placing those to be used first on the outside. Since the soup spoon is large and unmistakable, it is sometimes placed out of order between the knives and the smaller spoons. The napkin should lie at the left of the forks unless for lack of room, then it may be placed between the knives and forks. The glass, right side up, at the end of the knife, and a butter plate or bread-and-butter plate, just back and a little to the left of the fork, usually com-



From "Table Service", by Lucy G. Allen.

LUNCHEON COVER IN DETAIL



From "Table Service", by Lucy G. Allen.

DIAGRAM OF TABLE LAID FOR HOME DINNER (WITHOUT SERVICE OF MAID)

pletes the individual service except for the plate itself. This may or may not be in place when the meal begins.

It is difficult to give general rules in regard to the dishes to be used. Some prefer to use plates under soup plates and cereal dishes, and consider that as these protect the table and tablecloth they are real labor savers. But, in general, the use of extra dishes means extra labor in washing dishes; and vegetables, for example, should be served on the main plate unless they are so liquid that this would be unpleasant.

General Arrangements

If the food is to be served from the table, it should be so arranged that it can be reached as conveniently as possible by the one who is to serve. Near each dish should be placed the utensils which will be needed; these should not be used in common with another dish, and if the dishes are passed to allow each to serve himself, they should be passed with the dish so that no one is tempted to use his own fork or spoon. In serving, if very few people are present, ladies may be served first. Usually, however, it is now customary for the host or hostess to serve in order, beginning for the first course with the person on the right and at the next course with the person on the left.

References

"Meal Planning and Table Service", by N. Beth Bailey.
"Table Service", by L. G. Allen.
"The Up-to-Date Waitress", by Janet M. Hill.

Questions

1. What is the principle underlying the arrangement of silver and dishes on the table?

2. Tell: *a.* Where should the napkin be placed while you are eating?
   b. Should the napkin be laid on the table while it is being folded at the end of the meal?
   c. Is it ever permissible not to fold the napkin?
   d. Show the proper ways of using knife, fork, and spoon.
   e. Where should the knife and fork be placed in passing the plate for a second serving? Why?
   f. From what part of the spoon should we eat?
   g. Why should the spoon not be left in the cup?
   h. Why should a whole slice of bread not be spread at a time? How should bread be eaten?
   i. Discuss courteous ways of offering to serve another, of accepting or refusing.

3. Why should dishes offered by a waitress always be passed to the left of the person seated?

4. Why should finger bowls and tumblers not be filled too full of water?

5. In pouring a glass of water, why should the waitress avoid touching the rim of the glass? Should the same precaution be taken in putting away glasses after washing?

6. What care must be taken in laying a tablecloth? In folding it?

7. Why are doilies sometimes used in place of a tablecloth? At what meals are they most often used?

8. How should a napkin be folded when it is laundered?

9. What conditions modify the number of courses in which it is desirable to serve a meal?

10. Should you wash your hands before beginning to set the table?

Home Work

1. The breakfast suggested for this lesson is neither very light nor very hearty. What kind of meal one desires at this time depends partly on habit, but more on how the other meals of the day are distributed and how active one is. Plan a breakfast of each type. Which do you think is best adapted to your own family's needs, and why?

2. Think up all the reasons that you can why it would not be a good plan for you to go to school without eating any breakfast.

3. Set the table for breakfast until you are sure that you can do it perfectly — that is, when you succeed in putting everything on that should be there so that you do not have to get up unnecessarily to get forgotten plates or utensils, and when you think you cannot make any further reduction in the number of steps you take in setting it, and when you can place everything to the best possible advantage.

XIII

TEA

Marshmallow Wafers

A. Prepare Marshmallow Wafers.

Dent marshmallows by pressing on them as hard as you can with the handle of a knife. In these dents put pieces of butter the size of half a pea, and place each marshmallow on a square cracker. Heat in an oven until the marshmallows puff up and brown slightly. Remove them from the oven, and as they grow cold put a piece of candied cherry in the dent in each marshmallow.

Serve with tea.

B. Weigh a Teaspoon of Tea.

Tea is generally made by using from one-fourth to one teaspoon of tea leaves for each cup of tea. Allowing one-half teaspoonful, how many cups of tea could you make from a pound of tea? What would each cost?

C. **Class Experiments.** Green Tea.

1. To one-half teaspoon of tea add one-half cup of water which is hot, but not boiling. Let it stand three minutes.
2. To one-half teaspoon of tea add one-half cup of boiling water, and boil, covered, for five minutes.

3. To one-half teaspoon of tea add one-half cup of boiling water. Let it stand three minutes, and then strain about half of it from the leaves.
4. Let the remainder from (3) steep twenty minutes and then strain.
5. Pour one-half cup boiling water through one-half teaspoon of tea in a fine strainer or tea-ball.

Compare 1, 2, 3, 4, and 5, as to color, flavor, and strength.

Put a teaspoon of each into five test tubes, add one-half teaspoon of ferrous sulphate solution and set aside until the black precipitate settles. This precipitate shows the amount of tannin (a substance in tea likely to cause digestive disturbances) which is extracted from the tea by each method.

D. **Class Experiments.** BLACK TEA.

Repeat *C*, but use black instead of green tea.

Judging from these experiments which method of making tea is best? Why?

Compare the amounts of tannin in green and black tea.

E. MAKE TEA.

Serve with the wafers.

TEA

History

Chinese tradition recognizes the use of tea since 2700 B.C., but it was not used in England or on the Continent until the latter part of the seventeenth century, nor was it imported into America until 1711. In 1660 Pepys, an Englishman of some political and social experience, records in his diary the taking of his first cup of tea, which he ex-

plains is a "China drink." Now England and Australia use large quantities of it per capita compared with its consumption in the United States.

The Tea Plant

Tea comes to us mainly from China, Japan, Ceylon, and India. There has been an attempt, however, to grow it in our own country, and some is produced successfully in the South. Tea is made from the leaves of a shrub called *thea*, which grows from three to six feet high. In order to obtain the best flavor only new, tender leaves and buds are used, but as these shrubs send out four sets of shoots a year, there are four harvests. There are different grades

TEA LEAVES

a, Flowery Pekoe; *b*, Orange Pekoe; *c*, Pekoe; *d*, Souchong (first); *e*, Souchong (second); *f*, Congou; *h*, Bohea.

and varieties of tea plants, but, in general, the tea from each country has a characteristic flavor. Great differ-

ences, however, are due to the age and size of the leaf. The two leaves nearest the tip are the choicest and make the real Flowery and Orange Pekoe; but it is said the finest grades are so highly prized in their own countries that they are never sold in the United States. The leaves which grow farther and farther down the stem make less and less desirable teas. In selecting teas, then, the size of the uncurled leaves and their uniformity should be considered. The substitution of a larger leaf than the brand calls for, or the addition of tea "dust", or of too large a proportion of stems, are now the chief adulterations.

Green and Black Tea

There are two chief methods of preparing the leaves for market, and these affect not only the appearance but also the flavor and the composition of the beverages made from them. It is these methods of preparation which give us black and green teas.

The green color of the leaf is preserved in green tea by drying the leaf by artificial heat and at a temperature high enough to destroy any ferments that are present. During the drying, constant stirring causes the leaves to roll and curl. In making black tea, on the contrary, the leaves are only dried enough to wither slightly. They are still sufficiently moist to ferment before they are curled and dried thoroughly. This fermentation not only changes the color, but also somewhat affects the composition of the leaf. The exact process, number of dryings, and so forth, differ in different localities.

Formosa-Oolong is a cross between black and green tea. It is a semi-fermented tea which appears black, but has the flavor of a green tea.

Composition

Although the tea leaf is itself rich in protein, the infusion contains practically only caffein, tannin, and essential oils. None of these are in any sense food materials. Caffein, a stimulating substance also found in coffee, acts upon the nerves, producing stimulation or a feeling of well-being, but it is this which prevents sleep if the drinker is unaccustomed to the drug. Caffein is so soluble that practically all of it is extracted from the leaves however the infusion is made. This is also true of the essential oils which give the characteristic flavor. These so-called oils are not really oils at all, but are chemical substances present in very small amounts, and are somewhat volatile. For this reason tea leaves should be kept in covered cans or jars.

The bitter ingredient, tannin, is drawn out more and more if tea stands on its leaves, or is boiled. Tannin is disagreeable in taste, but, besides this, it may hinder the flow of digestive juices, and retard digestion. As a result of fermentation, black tea contains much less tannin and is usually recommended for that reason; but it is somewhat more stimulating than green tea, for it contains a little more caffein. Most people select the variety of tea they use merely by preference for its flavor without thought of composition.

Individuals differ greatly in their sensitiveness to the stimulants in tea, as well as to the tannin. Children are always much more easily affected than adults, and should not be allowed to take any stimulating drink. Authorities say that no one should touch tea or coffee until over thirty. Nervous people, of course, are most prone to notice bad effects from caffein, and those with weak digestions may be troubled by the amount of tannin which even well-made tea contains.

References

FREEMAN and CHANDLER. "World's Commercial Products."
Journal of Home Economics, Vol. 13, pp. 127–131, 177–180, 267–271. "Tea."

Questions

1. What is a beverage?
2. What is a decoction? An infusion? Which should tea be? What is meant by steeping?
3. Make a drawing of a tea leaf, and a sketch of a tea plant.
4. How can the bad effects of tea-drinking be minimized?
5. Should the use of tea be encouraged? What people should avoid its use entirely?
6. Why should a teapot be scalded immediately before making tea in it?

Home Work

1. Tea is often served with cream or milk or lemon. Usually sugar is added. In which of these ways would it have most food value?

2. If your family use tea, find out how strong they like it. Then make some for them. Remember all the precautions you should take to make a good cup of tea.

3. Using a dictionary if necessary, make a list of some of the best varieties of both black and green tea. Then at a grocery store see what you can find out in regard to their present prices. What ought you to expect to pay for a good tea? For a fancy variety?

XIV

COFFEE

Cheese Wafers

A. Prepare Cheese Wafers.

Sprinkle grated cheese, seasoned slightly with salt and paprika, on thin crackers, and heat them in the oven until the cheese melts.

Serve with coffee.

B. Cost of Coffee. Determine the number of cups a pound of coffee will make, allowing one rounding tablespoon of ground coffee to each cup.

C. **Class Experiments**. Making Coffee.

1. Mix one rounding tablespoon of coffee with one-half teaspoon of egg white and one tablespoon of cold water. Add one cup of boiling water. Boil three minutes and let stand in a warm place or over hot water for five minutes.
2. Repeat (1), omitting the egg. Why is the egg used?
3. Repeat (1), using one teaspoon of egg white. Compare carefully the resulting coffee for color and flavor with that made in (1). Can too much egg be used?

4. Repeat (1), using half an eggshell, crushed into pieces.
5. Repeat (1), omitting the egg, but adding one tablespoon of cold water after boiling. Compare carefully with (1) and (2). What is the use of the cold water?
6. Repeat (1), omitting the egg, but tying the coffee loosely in a piece of cheesecloth.

Which way of settling the coffee seems best? After coffee has been boiled, it should always be allowed to stand in a warm place for almost five minutes.

D. Percolated and Drip Coffee.

Coffee made by these methods may be compared with that made by boiling.

Coffee

Coffee Berries

The coffee bean is the seed of a fruit resembling a cherry. Coffee grows on an evergreen tree, originally a native of Arabia, but now cultivated in nearly all tropical countries. The berries are produced three times a year. They are picked and allowed to ferment to soften the pulp which is later removed. This leaves a husk which encloses two berries with their flat sides next each other. After the removal of the pulp the husk is dried and broken open and the berries released. These raw berries are exported to the countries in which they are to be used, and then roasted to develop flavor and to make them brittle for grinding. After washing they are sold either ground or unground. As after grinding they lose flavor somewhat quickly, the housewife usually buys either the whole berries (getting

the grocer to grind them or grinding them herself as she uses them), or else ground coffee in air-tight cans.

Brands of Coffee

Mocha, Java, and Brazilian coffees are the three principal kinds. The first two are used as trade names for coffees having special characteristics and do not necessarily mean the place where they were grown. Most coffee comes from South America, largely from Brazil. Differences of flavor are due partly to differences in variety, but are largely the result of differences in the maturity of the berries when gathered and in the length of time they are roasted. Berries are picked green, or left to turn red, or ripened fully to a purple. Rio, a brand which is very familiar, is a Brazilian coffee. Brazilian coffees cost less than Java. Mocha is most expensive. A mixture of Mocha and Java is a general favorite.

Coffee Berry and Leaf

Best Way to Purchase

Perhaps the most economical way to purchase coffee is to buy the roasted bean in five- or ten-pound bags and store in tins until needed. The whole beans bought in bulk cost

less than the coffees sold in pound tins. The crispness of the bean and the aroma tell whether the coffee is sufficiently fresh to be good. The flavor of old coffee can be somewhat improved by spreading it out well and re-roasting in an oven.

Composition of Coffee

The beverage coffee is chemically much like tea. It contains caffein and essential oil and tannin, but the tannin is in a somewhat different form and is perhaps less objectionable. While the percentage of caffein in the bean is less than in tea leaves, so much more coffee is used in making a cup of the beverage that a cup of coffee contains about as much caffein as three-quarters of a cup of strong tea.

Effects of Drinking Coffee

Coffee, then, like tea, should be avoided by the nervous, by those who have digestive disturbances, and by children. Cream or milk in coffee and tea seem to render it less digestible to some people. Individuals differ greatly in their sensitiveness to tea and coffee. Some are much more affected by one than by the other; some are sensitive to both. It is easy to find out how much one is stimulated. Those unaccustomed to coffee can see whether it makes them feel nervous or produces sleeplessness or indigestion. But coffee drinking becomes a habit and no great effect may be noticed. If, however, the individual accustomed to it will try going without, he can soon tell whether it was affecting him. If he has headache, or is unduly sleepy and dull, he may be sure he has been depending on coffee as a stimulant.

A small cup of black coffee taken at the end of a hearty meal sometimes acts as a promoter of digestion. This

usually signifies that the person benefited has eaten too much and would be better off if he ate less and went without the coffee.

Coffee Making

There seems to be only one good way of making tea, but there are a number of ways of making coffee, that are in common use. One method is to put the coffee in cold water and let it just come to boiling; another is to heat it for about twenty minutes, closely covered, in a double boiler. This is an easy method if you wish to make the coffee during a meal in order to have it ready for dessert.

It is usually easier to make good coffee with a percolator than by boiling, but those who are used to boiled coffee are likely to think that coffee made in a percolator is not so good as well-made boiled coffee.

Recent experiments seem to show that the best way to make coffee is to pour boiling water through very finely ground coffee — pulverized as it is called — or else to tie the coffee loosely in a bag and infuse it in boiling water as tea is made. They show that coffee should be made in glass or enamel or stone ware but not in metal pots, as the coffee actually forms a compound with the metals which changes the flavor of the beverage. The experimenters say that freshly roasted, finely ground coffee should be infused at a temperature of about 85° to 95° C. (185°–203° F.) for not over two minutes in a glass or porcelain container, and immediately filtered from the grounds.

In making coffee in large amounts for a picnic or some other special occasion, the easiest way is to put the ground coffee in cheesecloth bags. Allow plenty of room for the

grounds to swell. Since you know how many cups of coffee you can make from a pound, it is easy to calculate how much coffee to use.

References

Freeman and Chandler. "World's Commercial Products."
Journal of Home Economics, Vol. 14, pp. 142–143. "Studies in Coffee-Making."
Scientific Coffee Brewing. Joint Coffee Trade Publicity Committee, 64 Water St., N. Y. City.

Questions

1. Where is coffee grown? How prepared for the market?
2. Why does an egg settle coffee? Why are eggshells sometimes used? If the shells are to be used for this purpose, why should they be washed before the shell is broken, and not afterwards?
3. Explain why cold water settles coffee.
4. Is coffee a decoction or an infusion?
5. Describe the care which should be taken of a coffee pot.
6. Why are boys "in training" for football usually not allowed to drink coffee? What does this suggest in regard to its use?

Home Work

1. If your family drink coffee, find out how they like it made and then make it for them until you are sure that you can really make a good cup of coffee.

2. Find out what varieties of coffee are on your local market. What do these varieties cost? What is a reasonable price to pay per pound for coffee? What would be the cost of one cup of coffee at this price?

XV

COCOA AND CHOCOLATE

Oatmeal Cookies
Iced Cocoa

A. Prepare Oatmeal Cookies.

½ c. sugar	¼ tsp. salt
½ tbsp. melted butter	1 tsp. vanilla
1 egg	1 c. rolled oats

1 tsp. baking powder

Mix the dry ingredients and add the egg beaten slightly and the melted butter. Drop from a teaspoon on a buttered tin. Bake from five to seven minutes in a slow oven (365° F.). How many cookies does this recipe make?

B. **Class Experiments.**

1. Find out how many tablespoons there are in a cup by seeing how many times you can fill a tablespoon level full from a cup of powdered cocoa.
2. Weigh a cupful and a tablespoon of the cocoa and divide the first weight by the second. Record the results for use in *D*. Do your results in (1) and (2) agree?
3. Heat about half a cup of milk in two double boilers, filling the lower part of each boiler about one-third full of boiling water. Cover one closely, but leave

the other exposed to the air. Occasionally beat the milk in the covered boiler. Note in which case a skin forms on the milk.

4. With a thermometer determine whether the milk in the double boiler reaches the boiling temperature of water.

C. Prepare Cocoa.

For each cupful, use

1 to 2 tsp. cocoa	$\frac{3}{4}$ c. milk
$\frac{1}{4}$ c. water	1 to 2 tsp. of sugar if desired

A few grains of salt
A drop or two of vanilla, if desired

Boil for a minute or two all of the ingredients except the milk, then add it to the rest, and, if you are using a gas flame, boil until it begins to froth. Remove at once. Let half of this stand a few moments. Beat the other half with an egg-beater or a wire whisk until it foams. What is the advantage of "milling" (beating)?

On a coal stove, or if you are making cocoa in large quantity, it is safer to use a double boiler after the milk has been added.

If you like cocoa thickened, use a half to a third of a teaspoon of cornstarch for each cup of liquid; add it to the first mixture and boil for ten minutes. In making small quantities it will be necessary to replace the water evaporated.

D. Prepare Chocolate.

Use the same proportions as for cocoa, but use a weight of chocolate equal to the weight of the teaspoon of cocoa. Melt the chocolate with sugar in a saucepan over hot water, add boiling water slowly, stirring until smooth.

Then boil one minute, add the milk hot, and proceed as in making cocoa. Serve with cookies.

When would it be better in making cocoa and chocolate to scald the milk first?

Cocoa and Chocolate

History

We use chocolate so constantly and in so many ways that it is hard to realize that the world knew nothing about its use until after Cortez conquered Mexico. He took some of the beans back with him to Spain in 1528, where the secret of the preparation of chocolate was kept from the rest of Europe for some years. About seventy-five years later, the use of chocolate spread from Spain to Italy, then to France, and by the middle of the seventeenth century we find that chocolate houses, similar to coffee houses, were popular in both Germany and England. Later Linnaeus, in his famous botany of 1720, named it "Theobroma" or "food of the gods."

Production

The cocoa tree, which is indigenous to tropical American countries, produces a pod from seven to ten inches long, shaped somewhat like a thick cucumber. In the pod are found from twenty to forty beans from which chocolate and cocoa are manufactured. The pods are harvested twice a year, the beans being freed from the pod and allowed to ferment. This fermentation is carried on very carefully, for upon it depends the development of the flavor. It changes the color of the bean from white, often tinged with yellow, violet, or crimson, to a cinnamon-red. Roasting changes the beans further and loosens the husk, which is removed and sold as cocoa-shells, to be

boiled with water for a beverage. The part of the bean under the husk is called the nib. This is sometimes crushed and put on the market as cracked cocoa, but more often is ground and molded into a cake which is known as bitter or cooking chocolate; or, mixed with sugar, as sweet chocolate. The latter is often flavored, usually with vanilla.

COCOA POD AND BEANS

Cocoa is made from chocolate by the removal of part of the fat, approximately fifty per cent. The fat, in American manufacture, is merely pressed out and, as cocoa butter, forms a valuable trade product. Dutch manufacturers treat the chocolate with alkali in the process of making cocoa and add some spice, usually cinnamon, as well as vanilla. So-called "soluble cocoas" are merely those which are finely ground and so remain in suspension a longer time.

Effects of Drinking Cocoa

Cocoa, as a beverage, differs from tea and coffee in being fairly nutritious. As larger amounts of milk or cream are usually used in its preparation, this, too, increases the food value. Cocoa contains tannin, but in a quite different form from that found in tea, and its stimulating ingredi-

ent, theobromin, although like caffein in its effects, is much milder.

However, there is something of a reaction against the too free use of chocolate and cocoa, even in cases when the large amount of fat in chocolate does not cause trouble. Doctors caution some invalids and children against the use of chocolate. Many who do not feel stimulated by it notice the diuretic effect. Still, chocolate is probably much to be preferred to tea and coffee as a beverage, particularly as we are not likely to demand it with the same frequency.

Condiments and Flavoring Extracts

Food Adjuncts

Substances possessing practically no nutritive value, but consumed either for their stimulating effects or for their flavor, are known as food adjuncts. Tea and coffee belong under this head, as do seasonings or condiments such as spices, mustard, and pepper. These condiments are largely aromatic fruits, seeds, or leaves, containing volatile oils.

Too much highly seasoned food is not considered good for people because, although condiments may increase the appetite and stimulate the flow of digestive juices, a natural, unstimulated appetite is usually the best guide to the amount of food which should be eaten. This applies especially to little children. It is also true that some of these substances act as preservatives and so may hinder digestion. Vinegar, cinnamon, and mustard are all excellent preservatives, and cloves, nutmeg, and allspice, while they do not prevent, do delay the growth of micro-organisms. Ginger, and both black and red pepper, do neither. The flavorings vanilla, orange, and lemon are usually considered harmless.

Allspice. The fruit of an evergreen tree which grows in the West Indies and belongs to the same family as the clove. The fruit is gathered when it is full grown, but before it is ripe, and is dried in the sun. The name comes from the supposed resemblance in taste to a mixture of cinnamon, clove, and nutmeg.

Anise, coriander, cumin, dill, and fennel, are all fruits of various plants.

Bayleaf, marjoram, mint, and summer savory are dried herbs.

Capers. These are the flower buds of the caper bush. They are picked and dried, and stored in vinegar, but afterwards removed and packed for shipping without the vinegar.

Caraway. These so-called seeds are the fruit of a plant growing in northern and central Europe and Asia; it is also cultivated in this country, especially in California.

Cayenne. Cayenne or red-pepper is the fruit of the capsicum, not a true pepper, several species of which are grown in the tropics. They belong to the same family as the potato and tomato.

Cinnamon. True cinnamon is the inner bark of a plant native to Ceylon. Cassia is a thicker bark, resembling cinnamon in flavor, but less delicate, coming from India, China, and the East Indies. Much so-called cinnamon is really cassia. Both have a right to the botanical name cinnamon.

Clove. The flower buds of an evergreen grown

largely in Zanzibar, British East India, and the West Indies. The buds are dried in the sun or treated with wood smoke. Dark, well-formed cloves are best. Ground cloves deteriorate more quickly than do whole cloves.

GINGER. The root of a plant native to southern Asia. The plant, not unlike the iris in appearance, grows freely in moist places in tropical countries. The root is gathered when the stem withers, is scalded, or washed and scraped, to prevent sprouting, and is sometimes bleached. Preserved, Canton, and crystallized ginger are made from young roots.

HORSE-RADISH. This is the root of a plant related to the cress or nasturtium family. It is ground for use, and is sometimes mixed with vinegar.

MACE. This spice is made from the covering which surrounds the nutmeg seed.

MUSTARD. The product is ground from the seeds of various species of the mustard plant. The hulls may or may not be removed. Unground white mustard seeds are frequently used in pickling. French mustard is prepared by mixing ground mustard with vinegar and other flavoring materials, such as garlic and spices.

NUTMEG. Nutmegs are the dried seeds of a tree which resembles the orange. The tree is native to the Malayan Archipelago.

PAPRIKA. This is prepared by grinding the ripe fruit of the capsicum, carefully excluding seeds

and stem. This gives a product which is far less peppery than Cayenne.

Pepper. The fruit of the pepper plant, a climbing perennial shrub, grown in the East and West Indies. The unripe peppercorns make black pepper. The ripe pepper, with the husk removed, is ground into white pepper.

Salt. Table salt is composed largely of sodium chloride, usually with other mineral matter, such as calcium sulphate. Traces of calcium and magnesium chloride may also be present. In the United States, nine-tenths of all the salt produced comes from New York, Ohio, Michigan, and Kansas. Salt is obtained by mining rock salt, from salt wells, or by the evaporation of salt water from the ocean or from salt lakes. Salt produced in the third way is refined by redissolving in water and then recrystallizing.

Vinegar. In the United States, vinegar means the product resulting from the fermentation of apple juice. This is sometimes called apple or cider vinegar, but various vinegars made from other materials may also be sold under their appropriate names; as wine vinegar, malt vinegar, and grain or spirit vinegar.

Extracts

Extracts are solutions in alcohol of the volatile oils and other substances which give the characteristic flavors to various plants. Extracts of many varieties are on the

market, but vanilla, lemon, orange, and almond are, perhaps, the most commonly used.

Vanilla is a bean from a climbing vine, native to tropical America. The beans grow in a pod which is allowed to ferment after it is picked. Then the beans are dried for market. To make extract they are cut up and extracted with alcohol. Sugar is sometimes added. The tonka bean has a similar flavor.

Lemon and orange extracts are prepared by soaking the peel of the fruits in strong alcohol.

Almond extract is made from the oil of bitter almonds. This oil may be obtained not only from bitter almonds but also from the seeds of apricots and peaches.

All spices and extracts sold in interstate commerce must conform to certain fixed standards prescribed by Federal laws. Many states also prescribe standards.

References

"History and Use of Cocoa and Chocolate." Walter Baker & Co. Ltd., Dorchester, Mass.

"The Chocolate Plant." Walter Baker & Co. Ltd.

Olsen. "Pure Foods."

Questions

1. How many squares in a pound of cooking chocolate?
2. What are the advantages and disadvantages in using cocoa in place of chocolate in making frostings, cakes, and the like?
3. Is it easier to melt or grate chocolate for such use?
4. How do cocoa and chocolate compare in food value with tea and coffee?
5. Why would you not recommend giving little children cocoa or chocolate for supper?
6. Why is it unwise to eat too many pickles?
7. Why is it possible that gingerbread is more digestible for small children than spice-cake?

Home Work

1. If it is hot weather you may prefer to make cold cocoa instead of the hot drink.

Iced Cocoa.

Use the full amount of cocoa given in the recipe on p. 123. Boil it with the sugar in as little water as you can conveniently use. Cool it by placing the saucepan in a dish of cold water if you are in a hurry to have it cool. Add the milk cold and then set it in the ice-box to get very cold, or add ice to it. Cold foods taste less sweet than warm foods, so you may need more sugar than in hot cocoa.

A little whipped cream is often added to the glass of cold cocoa. Sometimes a little ice cream is added instead.

2. Find out which costs more per pound, chocolate or cocoa. What does a pound of sugar cost? Is it economical to buy sweetened cocoa (some brands have considerable sugar in them) and pay as much per pound as you would for straight cocoa?

3. Look over the list of condiments given in this lesson, and write down the ones that you do not know. Then see if you can find them at home, at school, or at a grocery store. Which ones come in more than one form?

XVI

TABLE MANNERS

Second Breakfast — Omelets, Fried Mush, and Syrup

A. Prepare and Serve a Breakfast.

Calculate the cost per individual. Suggested menu:

Fruit, fresh, or stewed dried fruit
Omelet
Fried mush with syrup
Tea, coffee, or cocoa

1. Omelets.

a. French omelet.
Use one tablespoon of water or milk to each egg. Season with salt and pepper. Have the bottom and sides of a frying pan well-buttered. Do not stir, but as the mixture sets, draw in the edges with a knife and tip the pan so that the liquid portion runs into the bottom of the pan. When it is brown on the bottom, fold and turn upside down on a hot platter.

b. Fluffy omelet.
Beat the yolk and seasoning with the milk and fold in the egg white, stiffly beaten. When it is brown on the bottom, place in an oven or under a gas broiler to dry out the top before folding.

Since it requires some skill to make omelets, and since large ones are more difficult to handle than smaller ones, it might be well here, for practice, to have one-egg omelets made for each person to be served.

2. Fried Mush.

Pack mush made of hominy, corn meal, or other breakfast cereal into a wet pan, until cold. Cut into slices; if moist dip into flour, and brown on both sides in a little fat in a frying pan, or spread with softened fat and brown in an oven.

3. Syrup.

Boil about three minutes a cup of brown sugar, half a cup of water, and a teaspoon of butter. When moderately thick, cool and, if desired, flavor with a few drops of vanilla.

Table Manners

It is commonly said, and surely with much truth, that it is easy to judge of a person's training by his ability to write a correct letter and his manners at table. While such manners are partly convention, in most cases there is a reason underlying the convention, and it is interesting to try to find out what these reasons are.

Seating People at Table

At home we all know where we are expected to sit at table, but at a dinner party, unless special arrangements are made for seating the guests, there would be great confusion. Unless there are place cards with the names of guests the hostess indicates where each person is to be seated. The guest of honor, if a man, is placed to the right of the

hostess; if a woman, to the right of the host. Host and hostess are seated at opposite ends of the table. If there is a waitress, the hostess enters the dining room last and sits at the end nearest the entrance door, but if there is no waitress, she places herself at the opposite end in order to be nearer the kitchen. As far as possible men and women at a formal dinner are arranged alternately, coming out in couples, the host leading the way with the woman guest of honor. A hostess shows her social skill in placing congenial people together.

All stand until the hostess is ready to sit. Convention says to sit down and get up from the left-hand side of your chair, because if the chairs are close together, and two people start to sit down from the same space between adjacent chairs, confusion results. If the chairs are placed at the table so that the front edge of the chair is in line with the hanging edge of the tablecloth, little adjustment of the chairs will be necessary and much noise will be avoided.

Proper Handling of Utensils

Silver, as explained in the directions for table-setting, should be so placed that there is no difficulty in telling which article should be used at any time, but convention says the hostess should begin to eat first, for then anybody in doubt has only to follow her lead.

The soup spoon is dipped into the soup away from the person, so that the edge which is covered by the soup will be the higher edge as the soup is eaten and there will be less tendency to drip. Soup is eaten from the side instead of from the point of the spoon, because the spoon is too large to go into the mouth and one is less likely to put it in too far from the side. Bread and crackers are not broken into soup, because this is likely to scatter crumbs. If

croutons or oyster crackers are served, these are already prepared and may be dropped into the soup without difficulty.

A child often grasps the handle of his spoon or fork with the back of his hand up. When he raises it to his mouth,

Correct Method of Holding Knife and Fork

this throws his arm up with his elbow out where it is almost certain to interfere with his neighbor. Instead, he should be instructed to hold it as he would a pen; then it will be raised with a wrist movement and with his elbow down.

The hands are placed as far up on the handles of knives, forks, and spoons as possible, so the fingers will not come in contact with the soiled parts. The fork may be used

either in the right hand, as the spoon is, with the tines up, or it may be used in the left with the tines down in the English fashion. It is not good form in cutting meat to hold the fork in an upright position, grasping it around the middle of the handle by the fingers. Perhaps the reason for this is that it is not nearly so secure a hold as by the other method.

It is not etiquette to cut up all the meat before beginning to eat, as we do for children. There should be time between bites for the necessary preparation of the next mouthful. The knife is never put into the mouth, because of the suggestion of cutting the lips or tongue. Since it is not used in the mouth, the knife should be used instead of the fork for taking butter from one's own butter plate. A whole slice of bread should not be spread at a time, partly for the same reason but mainly because of the difficulty. Spreading it on the left hand gives too much contact to be dainty. Only such food is eaten with the fingers as will not soil them. When in doubt, use a fork or spoon.

Salad and pie are eaten with a fork. If cut with a knife, it implies that the salad is not crisp or the pie is not tender. There is a fashion, sometimes followed, of eating ice cream with a fork instead of a spoon. Perhaps this is to show that the cream is frozen hard enough not to drip.

Plates should not be shifted as one finishes with them, — that is the duty of the waitress; to do so looks as if the person concerned were in too great a hurry. Nor should they be piled together. In passing a plate for a second serving, the knife and fork should be left on the plate because there is no other place to put them. They should be placed neatly together so that there shall be room on the plate to place the food, and in such a position that there shall be as little danger as possible of their falling off.

When the main course at dinner is finished, the knife and fork should again be arranged so that there is no danger of disturbing them in lifting the plate. At no time during a meal should the knife and fork be laid with the handles on the cloth and the other ends on the plate. This may cause liquids to run toward the handles, beside implying that the plate is too full. A spoon should not be left in a cup, because that makes it easy to tip the cup over.

The napkin should be placed on the lap with one fold left in it and should not be crumpled up. Dainty people sometimes contend that only a corner of the inside of the fold should be used to wipe the mouth, so that the soiled part shall be kept inside. But perhaps one should not have such a soiled mouth as to make this necessary. Care must be taken to wipe the lips before drinking if there is danger of making a greasy mark on the glass, and after drinking if the lips are at all wet. This is especially necessary after drinking milk, but, with care, there is no need to dip much of the upper lip in the milk.

Noiselessness in eating means special care in eating soup not to suck in the breath. This is a common fault, and there are many jokes about the man who will make his fortune by inventing a noiseless soup-spoon. For the same reason, the lips must be kept closed in chewing and only small mouthfuls should be taken. One should eat slowly, so as not to appear too hungry, and with sufficient deliberation to appear to be enjoying and appreciating what is served.

When asked to express a preference in regard to food, do so promptly, even if you have no strong feeling. In offering second servings, it is better to say "May I give you some meat" instead of "some *more* meat." "Yes, please" or "Yes, thank you" are correct forms of accepting; "No

more, thank you" of refusing. "No, thank you, I would not care for any" is awkward.

Remarks on the food are usually considered in bad taste, especially remarks in regard to foods for which one does not care. Think of the embarrassment for both guest and hostess if one inadvertently declares he does not like some food which appears later in the meal. At a small table the conversation is usually general, and unpleasant and too intimate topics of conversation should be avoided. At a larger party, where a general conversation can hardly be heard, conversation is carried on with the persons next to whom one is seated, and one shows politeness in seeing that neither is neglected.

The handkerchief should not be in evidence at table and, if possible, should not be used. Picking the teeth or putting the fingers in the mouth, touching the hair, or even the face, should all be avoided.

If at table articles are passed around by the people seated, then thoughtfulness in seeing that others are served with what they wish is necessary. Serving one's self without passing the dish shows selfishness. If it is necessary to ask to have something passed to you, do not address your request to the table in general, but to the one who is nearest the dish. Then the others are not unnecessarily troubled to discover who can pass it. At most formal dinners, however, guests are relieved of all passing by a waitress or butler, and then to pass a dish implies a reflection on the service.

During the meal one should sit erect, alertly attending to what is going on. Leaning back in the chair implies that one is fatigued or bored. Elbows off the table is a good rule. Most of our movements are habits and the only way to acquire table manners is by constant practice. We cannot be careless every day and then expect to go

through a formal occasion without a slip. We shall find ourselves automatically doing the thing we intended to avoid.

The hostess knows when the meal is concluded, and so she is the one to give the signal for leaving the table. At some dinners the ladies go first, leaving the men to smoke. Everyone rises, however, while the ladies pass out. If one is not to be present at the next meal at the same place, it is not necessary to fold the napkin. It should be placed on the table as compactly as possible and not spread out so that it is in danger of coming into contact with soiled dishes. If the napkin is folded, this should not be done on the table.

A dinner invitation necessitates a call afterward as an acknowledgment of the courtesy.

References

"Meal Planning and Table Service", by N. Beth Bailey.

Questions

1. List all the points in the section on table manners which you think would apply to breakfast as well as to other meals.
2. Can one assume good manners successfully on special occasions if one does not use them every day?
3. How could you lessen the cost of the breakfast served in this section without spoiling it?

Home Work

1. We are much more likely to be critical of other people's manners than of our own. Suppose you read over this section and note any ways in which you think you could improve your table manners. Then begin to practice them, beginning with those you think most important. Do not try too many changes at once, but add others as the first become automatic through habit.
2. Try preparing breakfasts at home on Sunday mornings.

XVII

COMBUSTION AND FUELS

Scalloped Potatoes

A. Prepare Scalloped Potatoes.

Wash, pare, and cut a potato into very thin slices. Put in layers in a baking dish. Season each layer with salt and butter, and pepper if desired. Cover with milk, and bake in a slow oven until the potato is soft.

B. **Class Experiments**. Fuels.

1. Take a narrow test tube and fill it two-thirds full of wood — the stems of matches will do. Heat, holding it cautiously in a flame. As smoke escapes, put a lighted match in the smoke and see if it can be set on fire. Notice the black residue remaining. This is mostly charcoal.
2. Is air necessary to combustion?
   Lower a candle or a burning splinter of wood into a bottle of air and cover as closely as possible. Does it continue to burn?
3. What is formed when fuel burns?
   a. Hold a cold glass tumbler for a moment over a burning candle. Observe whether moisture forms on the inside of the glass.

b. Burn a candle or a piece of wood in a covered bottle till the flame is extinguished. Remove the candle or wood quickly and pour in a little lime water, and shake it around. Does it become milky? Try lime water in a clean bottle of air. Carbon dioxide is the gas which turns lime water milky.

c. It is commonly said that food acts as fuel in the body. See if the "products of combustion", water and carbon dioxide, can be detected in the air breathed out.

Test as follows:

(1) Breathe on a cold pane of glass. Does moisture collect?

(2) Breathe through a glass tube or a lemonade straw into lime water. Do we breathe out carbon dioxide?

Combustion and Fuels

What We Mean by Combustion

Ordinary combustion is the union of the substance which is being burned with the oxygen of the air. We must have three conditions — something to burn, air or oxygen to burn it in, and enough heat to make them unite. Wood, for example, is a combustible substance, but it does not burn in our air unless it is heated. Not all materials have to be heated to the same degree to make them burn, and the point to which each must be heated we call its kindling temperature. Phosphorus has a low kindling temperature and so can easily be set on fire by the heat of friction; that is why it is used in the heads of matches.

Most combustible substances contain both carbon and hydrogen as well as a little oxygen. When they are burned in the air the carbon unites with the oxygen to make carbon dioxide, and the hydrogen with oxygen to form water, oxygen from the air being used in the process. The common fuels are inexpensive substances which are largely composed of these three elements. Some of our foods, too, contain these same elements in large amounts and are spoken of as fuel foods.

Combustion in the Body

While combustion in the air is usually so rapid that both light and heat are produced, when food is burned in the body the process is a much slower one than ordinary burning, and no light at all is produced. The heat that is formed is used to maintain our body temperature, or else is transformed as it is needed to enable us to move and carry on other body activities. So all fuel foods are energy producers. The protein, fat, and carbohydrates of our food are all good "fuel" for our bodies, although protein is a body-builder as well, for protein has nitrogen in it. But the nitrogen does not help in the production of heat. Of course, the elements in fuels and foods are put together very differently, so that they are entirely unlike in their nature, and the body could not burn coal or wood instead of food.

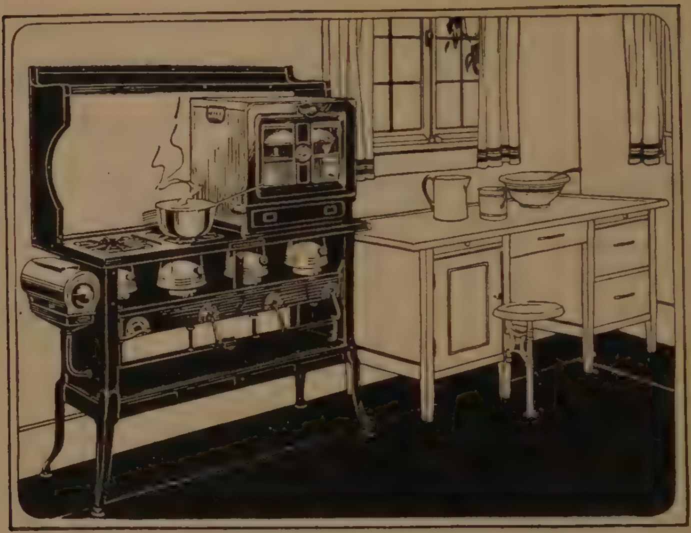
Ordinary Fuels

The fuels that are most widely used in this country are wood, coal, kerosene, and gas. Wood is becoming so expensive and requires so much space for storage that, in cities, it is used only in starting a coal fire. In country districts, where wood is cheap, wood stoves are still in

common use. Wood must be set on fire by piling it on top of burning paper, straw, or shavings. Such kindling is not sufficiently hot to set fire to coal, so, in laying the coal fire, both paper and wood are used. Wood is roughly divided into two classes, hard and soft; the first is desirable when long-continued, steady heat is necessary; the other for quick, hot fires. For kindling, soft wood must, of course, be chosen. The usual way of selling wood is by the cord, which consists of one hundred and twenty-eight cubic feet.

Coal is of two general kinds, anthracite or hard coal, containing about ninety per cent of carbon and very little gas, and bituminous or soft coal which contains gas and burns with considerable flame. The latter variety is dirty to handle and gives off much soot. It costs less by the ton, however, than hard coal, especially in some parts of the country, so it is often commonly used. A fire made with it requires more frequent attention than one made with hard coal, and when this and the cost of the cleaning and laundering which it necessitates, as well as the wear that this extra laundering means for fabrics, are all taken into account, it is doubtful whether the use of soft coal is really cheaper. Coal is sold by the ton; a long ton is 2240 pounds, a short ton only 2000 pounds.

Kerosene is also a much-used fuel, and in the blue-flame stoves a very satisfactory one. It is one of the oils present in petroleum, a mixture of natural oils found in the ground in large quantities in some parts of the country. In order to be sure that the more inflammable oils are not left in the kerosene, in most states the quality is regulated by a requirement that the flashing point shall not be below a certain temperature. The flashing point is the temperature at which the vapor from the kerosene will catch fire or flash without setting fire to the oil itself. But since the advent of the automobile there is so much demand for



A Blue-flame Oil Stove

gasoline that there is little danger of its being left in the kerosene. However, as all kerosene is explosive, care must be taken in using it. Stoves and lamps should be filled only by daylight and never when they are lighted or hot. Kerosene is sometimes poured on a fire of coal or wood to act as kindling, and there have been many accidents from such use. Safety requires that it should never be used in kindling. The danger lies in pouring it on after the fire is started, or when there are hot ashes in the bed of the fire.

Gas is a much cleaner fuel to use than any of those already mentioned. There are many varieties. Natural gas, like kerosene, is found in the ground in certain parts of the country. Its cost is much below that of artificial gas. The latter gas is made by two different methods, one giving us coal gas, the other water gas. Coal gas is

obtained by heating coal, usually semi-bituminous, in retorts, so as to drive off the gas which it contains. Water gas is made by passing steam over heated coal; then this is enriched by the addition of other gases in order to make it more efficient. Any gas is dangerous, because, when it is mixed with a certain amount of air, it becomes explosive, and because some of the gases present, if they escape unburned, are highly poisonous. Water gas is particularly poisonous. Leaks in gaspipes should not be neglected. A light should never be taken into a room where there is a strong smell of gas, windows and doors should be opened, and, if necessary, the gas should be turned off from the whole house by the main stopcock near the meter. The surest way to detect small leaks is to paint over the suspected places with strong soapsuds, and notice where bubbles are blown.

Acetylene is another sort of gas used for fuel in special stoves. It is manufactured, usually on a small scale, by the automatic dropping of calcium carbide into water. This gas requires special burners, but gives a brilliant light. It seems still to be a matter of dispute whether it is highly poisonous as well as explosive.

Gasoline gas, sometimes called air gas, is made by pumping air through gasoline. Usually the law requires the gasoline tank to be outside and at a certain distance from the house, although the mixing chamber where more air is added may be nearer. The gas makes an excellent fuel and does not contain carbon monoxide, the compound in coal gas which is most poisonous.

There are two kinds of alcohol which are common. One, wood alcohol, ought not to be used, because its fumes are poisonous. It is much cheaper than the other variety called grain, or ordinary alcohol, because that is so highly taxed. In recent years a way out of this difficulty has

been found in the use of denatured alcohol. This is merely grain alcohol to which some substance has been added that makes it impossible as a beverage, and thus it escapes having to pay the heavy tax otherwise imposed. The substance added in no way impairs its use as a fuel.

The use of electricity for cooking has certain advantages which are furnished by none of the fuels. In its use there are none of the products of combustion to get rid of, there is no flame to set fire to the unwary, no matches to be looked after, and its control is simple. It is, however, generally too expensive for common use. Electricity is measured by the kilowatt hour, the cost varying from about ten to fifteen cents. The dials on an electric meter are not unlike those on a gas meter and can be read easily.

References

White. "Fuels of the Household."

U. S. Dept. of Commerce. Bureau of Standards Circular No. 55. Sections on Coal, Wood, and Heating Value of Fuels.

Questions

1. Name the different substances which may be used as fuels and arrange them in the order of their kindling temperatures.
2. Name the different kinds of coal used in the house, and, briefly, characterize each.
3. In an ordinary wood or coal stove, what becomes of the products of combustion? Where do they go in a gas range? Account for the difference in arrangement.
4. How is illuminating gas manufactured?
5. What source of heat, sometimes used for cooking, is not the direct result of combustion?

Home Work

1. Determine the comparative costs of the different fuels used in your locality. Which is most commonly used and why?

2. Look in a cook book and see how many ways you can find to cook potatoes. In how many of these ways do you commonly have them served at home? Star all the ways of cooking potatoes that you think not too complicated to be frequently used, and then see if your family will let you try some of the recipes to determine whether they like them.

XVIII

DRAFTS AND THE COAL RANGE

Tamale Pie
Rice and Bean Stew

A. Prepare Tamale Pie.

$1\frac{1}{4}$ c. corn meal	1 onion
4 c. boiling water	2 tbsp. fat
1 tsp. salt	1 lb. ground steak
1 c. canned tomato	

Cook the corn meal with the salt and water for at least five hours in a fireless cooker, or three-quarters of an hour in a double boiler (See IX). Peel and slice the onion, brown it in the fat, and add the meat, stirring it until it loses its red color. Then add the tomato and season the mixture to taste with salt and pepper. Line a greased baking dish with a layer of corn meal, pour in the meat, cover it with the rest of the corn meal, and bake the pie for half an hour.

This dish, with bread and butter, makes a good lunch or supper.

B. **Class Experiments.** Drafts.

1. What is the effect of a draft in a stove? Try the following experiments to find out:

a. Put a lamp chimney over a lighted candle, but hold it so high that it will not touch whatever the candle is standing on. Take small pieces of some light material (threads of cotton wool will do) and hold them first above the chimney, then underneath it. Is the draft passing through the chimney, and in what direction, up or down?

b. Place a lighted candle in a saucer of water, and put the lamp chimney over it so that it, too, rests in the water. Why does the candle go out?

c. Fit a piece of pasteboard lengthwise into the lamp chimney. Relight the candle and replace the chimney, but set it so that the candle flame is on one side of the pasteboard partition. Why does the candle behave differently? Test the draft.

d. Take an empty pasteboard shoe box. Cut two holes in the cover, one at each end. Each hole is to be a little smaller than the bottom of a lamp chimney. With a drop of melted wax, stick a lighted candle to the bottom of the box so that the flame will be under one of the holes when the cover is put on. Cover, and put a lamp chimney over each hole. Test the draft by holding threads of the light material over each chimney.

2. Examine a wood or coal stove, or range. Is there a place for the air to come in as well as a place for products of combustion to pass out? Can the size of these openings be regulated?

Coal Stoves

Drafts

The firebox in a coal stove could not be air-tight or no fire would burn in it, for a constant supply of air is necessary. Notice how the draft in a coal stove is arranged. The air coming in the door below the fire ordinarily passes out directly through the stovepipe, but there is a check-draft in the stovepipe which may be left wide open or turned until it nearly closes the pipe, so that the amount of draft supplied the fire may be controlled by both the door and the check-draft. Besides these two means of controlling the supply of air, there is a third way. The upper door into the firebox or a lid on the top of the stove may be left open, so that cold air blows across the top of the fire and cools it, causing it to burn much more slowly.

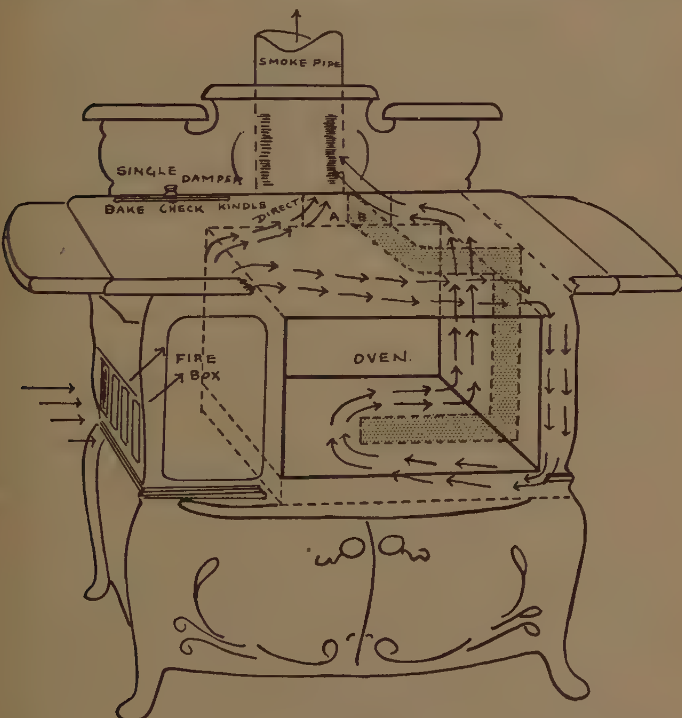
Merely having openings into a closed space would not cause a draft unless a portion of the air were heated. Can you see why this should make the air circulate? It is because heated air expands so that the amount present in any given space is less than it was before. It is therefore lighter. But this light air is surrounded by cold air, which is heavier and so is pulled down harder by the attraction of gravitation which pulls everything toward the earth. The cold air, being pulled harder, naturally displaces the warm air and so pushes it up. It is often said that hot air rises, but this is not strictly true, because it would not rise at all if it were not for the colder, heavier air around it.

In the ventilation of rooms advantage is taken of the fact that the circulation of air is caused by differences in temperature. Hoods are often installed over stoves to carry off the odors of cooking. These work in the manner indicated above, the hot air over the stove being pushed up into the exit pipe by the pressing down of the colder air

around. The hood itself acts merely by confining the warm air and preventing it from scattering.

Heating the Oven

It would seem as if a fire built beside one end of the oven would heat it so unequally that it would be difficult to cook



Coal Stove

The arrows show circulation of air through A, directly to smoke-pipe, and through A, indirectly around oven.

in it. Notice how this difficulty is overcome by making the hot gases from the fire pass entirely around the oven

when we wish to use it. This is accomplished by shifting the oven damper, which closes the direct opening into the stovepipe and so forces the gases to pass around the oven before escaping.

Care of the Stove

Notice that there is a handle which may be fitted on a bar from the grate. By turning the handle the grate may be rocked back and forth to shake down the ashes. The firebox itself is lined with fireproof material to protect the iron as much as possible from gradually burning out. The top of the stove cannot be so protected, so care must be taken to keep the fire about level with the top of the oven. This means a saving of coal, too, and generally gives as efficient a fire.

Anything spilled on a stove should be wiped off immediately with soft paper or cotton waste. If necessary, soap and water or sapolio can be used later, for, when cold, the top may be cleaned by rubbing with a few drops of kerosene. In order to protect the iron from rusting, it is necessary to keep it well covered. Blacking is usually used for this purpose. The blacking is rubbed on while the stove is cold and polished when it is warm. A stove that is to be out of use for some time is still better protected by covering it with a thin coating of oil or grease.

Starting the Fire

Here are brief directions for starting a fire:

1. *Clean the firebox* by closing all the dampers and shaking down and removing the ashes. In a wood stove leave a layer of ashes, as this makes the wood burn better.

2. *Open the door into the ash-pit and the draft into the stovepipe,* but close the dampers that check the fire.
3. *Build the fire* by removing the covers from the top of the firebox, laying crumpled paper on the grate, and piling kindlings on it loosely so that there is plenty of room for the air to circulate through them. Then put on a small shovel of coal, light the paper below, and replace the covers. When the fire is burning well, put on more coal, close the door in the ash-pit, and turn the damper in the stovepipe so as to lessen the draft.

Fireless Cookers

There is an old story of a man who was held to be a wizard because he could blow both hot and cold; he blew on his hands to warm them and on his soup to cool it. But fireless cookers can do just as seemingly contrary things, since they can keep hot things hot and cool things cool. All that is necessary is that they be constructed in such a way that little heat can pass in or out of them.

Types of Fireless Cookers

The simplest form of fireless cooker is the hay box; literally a box stuffed with hay which, with the air spaces between, makes a non-conductor of heat. Usually, the hay is kept from scattering by covering it with stout cloth. Whatever is to be cooked is placed in water in a saucepan or pail, heated to boiling, tightly covered, and placed in the center of the hay. The difficulty with this type of cooker is that some steam with the odor of the food escapes from the cooking vessel and is absorbed by the hay, which gradually becomes musty and must be replaced. More efficient

cookers are lined with non-absorbing material, such as enameled metal, which can be washed if desired. The metal, being a fairly good conductor of heat, even when enameled, must be made double with an air space between. Further insulation can be put between these two layers. This type is commonly furnished with soapstones, which can be heated as hot as desired and placed inside to increase the heat and make even baking possible.

There is now on the market a combination of a gas stove and a fireless cooker which is convenient. The range can always be used as an ordinary gas stove, but over some of the top burners are hung cylinders which may be lowered at will to cover the kettle which has been heating over the burner. At the same time, the flame is extinguished by the automatic turning off of the gas. The oven, too, is insulated and may be used as a fireless cooker also. While the first cost of these stoves is more than that of the ordinary types of ranges, they are undoubtedly great savers of gas. Some electric ranges, too, are arranged so that the oven can be used as a fireless cooker. The oven is heated by electricity, the current is then turned off, and the cooking is continued without any further heating. Of course, this way greatly reduces the cost of the cooking because so much less electricity is needed.

Testing the Efficiency of Fireless Cookers

Of course, none of these cookers is so constructed that no heat can escape, and, gradually, the material inside becomes cold. The efficiency of different cookers is measured by the heat that is retained after some hours of standing. To test, equal amounts of boiling water are put in different cookers, and the temperature of water is taken after a given number of hours.

Some Other Heat-Insulated Utensils

A thermos bottle uses the same principle as a fireless cooker. Since heat cannot pass in any more readily than it can pass out, both may be used to keep cold drinks cold by protecting them from the heat of the air. Thermos bottles are made with a vacuum between the inner and outer layers, and are more resistant to the passage of heat than the ordinary fireless cookers.

Ice-boxes and refrigerators, too, are efficient in the measure in which they are non-conductors of heat, this depending on the kind and number of layers of material used for "packing." Some people recommend the wrapping of the ice in the ice-box in paper of some heavy material to keep it from melting so fast by protecting it from the heat of the air inside the box. This must not be done if it checks the melting too much, for it is the melting of the ice which causes the low temperature in the box, and the lowering of the temperature is in proportion to the melting, the heat of the air being rendered latent as the ice changes to water.

References

U. S. Dept. of Commerce. Bureau of Standards, Circular No. 55, sections on Amount of Heat used in Cooking and Some Other Household Operations, Regulation of Stoves, Ranges, and Other Heating Appliances, and on Oven Thermometers.

U. S. Dept. of Agriculture. Farmers' Bulletin No. 771. "Home-made Fireless Cookers and Their Use."

Questions

1. Why does a match go out if it is blown or shaken too hard?

2. Why does a fire burn more brightly if it is blown with a bellows? Why does it not go out?

3. Explain why, in building a coal fire, paper and wood are also used. Why is the paper twisted and crumpled and the wood laid criss-cross?

4. How is an oven heated, and how is the temperature of an oven controlled?

5. What difficulty occurs if the ash pan is allowed to get too full?

6. Why should ashes and soot be frequently removed from the flues back of and under the oven?

7. Why is a fire lighted at the bottom and not at the top?

8. How would you arrange to keep a fire over night? Give the reason for each act.

9. What is the danger in allowing coal gas to escape?

10. Describe different types of fireless cookers.

Home Work

1. If you have a coal stove at home, examine it and see if you can tell exactly how it works. Coal furnaces and laundry stoves, and wood and coal heaters for water, all work on the same principle as the kitchen stove which has been described; so if you have no coal range you can find some other stove to examine which, with the exception of the oven-damper, will have much the same arrangements. Try building a fire in some one of them, or at least in a fireplace.

2. Here is another excellent dish for lunch or supper.

Rice and Bean Stew.

1 or 2 onions	2½ c. tomato
1 tbsp. fat	2 c. canned kidney or other red beans
¾ c. rice	
1 tbsp. flour	1 tbsp. salt

Peel and slice the onions and brown in the fat. Wash the rice and add it, with the tomato, beans, and salt, to the onion. Cook the mixture in a covered kettle or frying pan for half an hour, then mix the flour with enough water to pour, add it to the stew, and boil for two or three minutes.

XIX

FLAME AND GAS STOVES

Chocolate Bread Pudding
Brown Betty

A. Prepare Chocolate Bread Pudding.

$1\frac{1}{2}$ squares chocolate	2 c. bread crumbs
1 qt. scalded milk (or milk and water)	$\frac{1}{2}$ c. sugar
	$\frac{1}{2}$ tsp. salt
1–2 eggs, beaten together	$\frac{1}{2}$ tsp. vanilla

Melt the chocolate over hot water. Add about half a cup of the hot milk, stirring it into the chocolate. Mix the ingredients together and bake in a greased pudding-dish until firm. Serve warm with milk or cream.

B. **Class Experiments.** Care of a Gas Stove.

1. Take a gas stove apart for cleaning.
2. Blacken the stove.
3. Examine a Bunsen burner. Light it, and alternately open and close the holes at the base. Hold a cold saucepan for a moment in the clear flame. When it is again cold hold it in the yellow flame. What effect on the flame has the admission of air to the gas? See whether air is admitted to the burners in a gas stove.

When the burners beneath the oven of a gas stove are to be lighted, it is always safer to open the oven door, or, at least, set it ajar.

Flames and Gas Stoves

Flames for Cooking and Lighting

A flame is burning gas, but the flame may be colorless or yellow. For illuminating purposes a yellow flame is de-

A Modern Gas Stove

sirable, because the glowing particles of carbon in the flame give off light. But for cooking, a blue flame, one that is as nearly colorless as may be, is best. This is not only

because such a flame is hotter, but because the yellow flame will deposit soot; and unburned soot on the saucepans means wasted fuel as well as extra trouble in washing.

Gas is made to burn with a blue instead of a yellow flame by admitting air into the burner, and the air furnishes enough oxygen to burn up the soot.

Precautions in Using Gas Stoves

Air admitted to the gas furnishes an amount of oxygen sufficient to burn up the soot. When a gas stove is first installed, the plumber making the connection regulates, by means of a small valve in each, the amount of air necessary for each burner. This may need to be changed later if conditions change; but usually any change in the flame, particularly a sudden one, means that the burner has become clogged, perhaps by something spilled over it. In this case, if it does not readily burn clear again, the burner should be detached and boiled out in a weak solution of washing soda.

One of the greatest difficulties experienced may be in the striking back of the flame. By this is meant the catching fire of the gas in the mixer; the gas burns with a roaring sound and gives off a disagreeable odor and the flame is small and yellow. This can be remedied only by turning the gas off completely and, if the burner is hot, giving it time to cool before relighting. The striking back may occur if an attempt is made to light the gas too soon after it is turned on, if the gas is turned too low so that there is not sufficient pressure, or if the flame is blown by a sudden draft. A stove in a bad position between windows and doors may give much trouble in this way, but, usually, the difficulty may be overcome by devising a screen to cut off the draft.

Besides remembering to open the door of the oven before lighting, one must also be careful, when the gas is turned low in the oven, that the flame has not actually gone out, leaving a little gas flowing. A habit should be formed of frequently looking, under these circumstances, to see if the gas is still lighted.

The heat of a gas stove is much more easily regulated than is that of a coal stove, and care should be taken not to waste gas by lighting it ahead of time, by leaving it lighted when it is not in use, or by using more flame than is necessary. Water that is just boiling is just as hot as water that is boiling rapidly, and we cannot cook any faster with one than the other.

Many gas stoves now have oven regulators which may be set so that the oven will remain constantly at the temperature you desire. These are exceedingly convenient and save a great deal of trouble because one no longer has to watch the oven to be sure that it is at the right temperature, and this eliminates guesswork from baking. These regulators can easily be attached to stoves that are without them.

Gas is a convenient fuel to use, because there are no coals to carry and no ashes to take care of. The products of combustion are supposed to be pushed through the pipe at the back of the stove. Probably, however, this carries off more from the oven than from the upper burners, and a hood over the whole is much more effective, because it carries off the odors of cooking as well.

A stop-cock is frequently put in the pipe connecting the stove with the main gas pipe. As most burners leak a very little, even with the best of care, this is a good practice, making it possible to turn off the gas completely whenever the stove is not to be used for some time. In case of a serious leak, its use is obvious.

Gas Meters

Gas is metered, or measured, by the cubic foot. It generally costs from eighty cents to a dollar and a half for a thousand cubic feet of gas. The meter is ordinarily read every month and the reading of the month before subtracted from the present reading, in order to determine how much has been used. In some places there is a minimum charge per month which must be paid even if no gas has been used. In still other places there are slot meters which allow gas to pass after a certain coin, usually a quarter, has been inserted, the gas flowing until the amount paid for has been used. These are used mostly in tenement houses where bills are hard to collect and the frequent sending of a man to turn the gas on and off would be expensive.

Reading a gas meter is a simple matter, and in case of disagreement over bills is a useful accomplishment. A gas meter shows three dials; the hand on each dial turns in a direction opposite to the one next it, in order to help obviate mistakes in reading.

Each division of this dial denotes 10,000 feet.

Each division of this dial denotes 1000 feet.

Each division of this dial denotes 100 feet.

How to Read a Gas Meter

Read from left-hand dial to right, always taking the figures which the hands *have passed*. The dials above, for example, register 3, 4, 6, and, adding two ciphers for

the hundreds, show 34,600 feet registered. To ascertain the amount of gas used, deduct the previous register as indicated on the dials above by dotted hands, 1, 7, 3, from the present register, 3, 4, 6, as follows:

Register by dials shown above	3.4.6.00
Registered by previous statement, indicated by the dotted hands	1.7.3.00
Number of feet used between readings	17,300 ft.

If you wish to know how much gas is being used, you need only watch the dial at the right hand, each figure of which means 100 feet.

The hand on this dial passes from 1, 2, 3, 4, 5, 6, 7, 8, 9, to 0, and a complete revolution shows a consumption of 1000 feet, which appears on the dial next to it on the left as 1.

The average burner at the top of a range, when turned on full force, burns about two cubic feet of gas an hour, while the oven burner consumes from thirty to forty cubic feet. From these figures the advantage can readily be seen of using a small portable oven placed over a top burner, instead of the large oven. An oven of this sort, costing from one to two dollars, soon pays for itself, especially in a small family, although the saving is not the full difference between these figures, for the burners in either case are not left on full after the oven is once hot.

The consumer is responsible for leaks which occur in the gas pipes on his side of the meter, and it is for his advantage to have these attended to promptly, not only because of the danger, but because the escaping gas passes through the meter and is registered against him. Leaks on the other side of the meter are, of course, not so registered, and, since they represent loss to the gas company, are attended to by the company.

References

U. S. Dept. of Commerce. Bureau of Standards, Circular No. 55, sections on Gas and Electricity.

Questions

1. Discuss the advantages of a gas over a coal range.
2. What may be the result of letting milk and the like boil over on a gas stove?
3. Why should not the flame in a gas stove appear yellow?
4. Why should a gas burner in a stove be turned on fully before it is lighted? Explain.
5. What would you consider wasteful use of gas in a stove?
6. Explain the best methods of extinguishing if the following catch fire:
   - *a.* clothing
   - *b.* kerosene or gasoline
   - *c.* alcohol or wood
7. What is the best home treatment for burns or scalds?

Home Work

1. If you have any kind of meter in your home, learn to read it. Check up on the amount of gas, water, or electricity that has been used for a month and see whether the bill that is presented for it is correct.
2. Learn to blacken the stove.
3. Here is another dessert that you can try making:

Brown Betty.

2 c. bread crumbs	½ c. brown sugar
¼ c. butter	½ tsp. cinnamon
5 apples, pared and sliced	½ c. hot water

Melt the butter in a saucepan and stir the crumbs into it. Put a layer of crumbs into a baking dish, then a layer of apple, and sprinkle with sugar and spice mixed together,

repeating until you have used all the apples, but save enough crumbs to make a top layer. Pour in the hot water before you add the crumbs on top. Bake until the crumbs are brown. The juice of half a lemon and a quarter of a teaspoon of nutmeg may be used in place of the cinnamon.

XX

HOW HEAT PASSES FROM ONE PLACE TO ANOTHER

Broiled Bacon and Potato Salad
Silver Cleaning

A. Prepare Potato Salad and Bacon.

Place a crisp slice of bacon on the plate with each serving of potato salad.

Potato Salad.

4 c. cubes of cold, boiled potato	4 tbsp. oil
1 tsp. salt	2 tbsp. vinegar or lemon
	Pepper

Mix the seasonings with the oil and vinegar, then pour over the potato and lift lightly with a fork until every piece of potato is coated. A few drops of onion juice or a very little chopped onion may be added. A garnish of parsley or a little chopped parsley is sometimes used. Hard cooked egg, chopped or sliced, cold boiled beets, minced celery or chopped cucumber, are frequently mixed with the potatoes.

Broiled Bacon.

Lay slices of bacon, with the rind cut off, flat in a hot frying pan. When one side is brown, turn each slice.

Bacon may also be laid flat or in a rack in a shallow pan and browned in the oven. To be crisp when done, bacon should be sliced thin.

B. Class Experiments.

HOW HEAT PASSES FROM ONE PLACE TO ANOTHER.

1. Radiation of heat.
   a. Stand in front of a hot stove or fire and notice the heat. Then hold a screen between your face and the fire. Do you feel the heat on your face as before? Yet the air that surrounds you is still warm. Heat that passes in straight lines directly from one object to another at a distance is called radiant heat. The heat is said to pass by radiation.
   b. Determine whether a bright, clean surface or a dull, rough one radiates heat more easily. Take two cheap tin cups, one that is bright and new and polished as highly as possible, the other that has been held in a flame until it is rough and dull and sooty. Have both cups at room temperature and fill each with equal amounts of boiling water. Test with thermometers to see which cools first. Is it economical of heat to keep the sides of a saucepan smooth and clean?
2. Conduction of heat.
   a. Hold one end of a long piece of wire, or an iron poker, in a flame, while you hold the other end in your hand. Feel how the heat is led along or conducted from one part of the metal to another.
   b. Are all substances equally good conductors of heat? Repeat (*a*) with a glass rod or a long

splinter of wood, instead of the wire. Does the other end grow as hot? Hold a test tube two-thirds full of water in a flame, but at an angle so that the water at the top is directly heated. Can you get the water at the top hot while the water at the bottom is still cool? Is water a good conductor of heat? Is air?

c. Test the relative conductivity of two saucepans by taking two of different materials (as for example, one of aluminum and one of granite). Pour into them equal amounts of cold water, and place them over two flames which are equally hot, or heat first one and then the other. Determine which boils in the shorter time.

3. Convection of heat.
Put cocoa shells or sawdust into water and heat — in a glass beaker if you have it. Notice the movement of the particles. Does this indicate movement of the water also? Decide how the heat has been transmitted to each in toasting bread, in broiling bacon, and in boiling potatoes.

Hot-Water Systems

The passage of heat directly through the air to an object in front of it, and the passage of heat from one particle of a heated material to the next, does not seem so puzzling to understand as convection. But if you think about how a draft is caused by the heating of part of the air, you will readily understand the convection of heat. Let us think for a moment of convection of heat in water.

Convection of Heat

"Convection" is not a word that is very familiar to us, but we are well acquainted with the word "convey", meaning "to carry." By the convection of heat by water, all we mean is the carrying around of heat by the particles of the water itself. Can you think what makes these particles move?

In conduction, heat is said to be passed on from one particle to the next. Water is known to be a poor conductor of heat, although nobody knows why this is so. In the experiment in which water with sawdust in it was heated in a beaker, the water would not readily pass the heat from one particle to the next. Instead, the water at the bottom of the beaker became heated, and heat has exactly the same effect on water that it has on air. The water which is heated expands and so becomes lighter. Then it is pushed up by the colder water above, which is pulled down harder by gravity, to become heated in its turn. The whole of the water becomes hot, not by the passage of heat from one particle to the next, but by the movements of the particles themselves, carrying the heat with them. Thus a circulation of the water is started, the hottest water rising to the top.

Of course, heat is also conveyed by the movement of air — another poor conductor of heat. You will remember how the oven in a coal stove is heated by the passage of the hot gases around it, the gases conveying the heat and then passing it on to the metal of the oven, which is a good conductor.

Hot-Water Systems

Use is made of these facts in getting hot water to run from the heaters through our faucets. When we heat the

water in a boiler it becomes warm first at the top. This can easily be felt by placing your hand on the outside of the boiler. Now when we open a faucet at the sink the hot water rushes out first because it is lightest and so is on top of the cold water.

Boilers and hot-water pipes lose heat through radiation and contact with air, and, to decrease the loss, are sometimes jacketed with asbestos. Asbestos is a mineral substance, finely shredded and pressed into a sheet. It is not only a poor conductor of heat, but is fire-proof as well.

The Selection of Kitchen Ware

In choosing utensils for the kitchen many things must be taken into consideration.

Do Not Have Too Many Utensils

In general, for the sake of storage room and convenience of access, the number of utensils should be kept as small as possible. Utensils which can be used for many purposes should be selected rather than those that fit a single need, unless that need is frequent. In nearly any kitchen are to be found a number of utensils that are good, but are so seldom needed that they are never used, because it is too much trouble to find and wash them for the occasion.

Points to Consider in Selecting Utensils

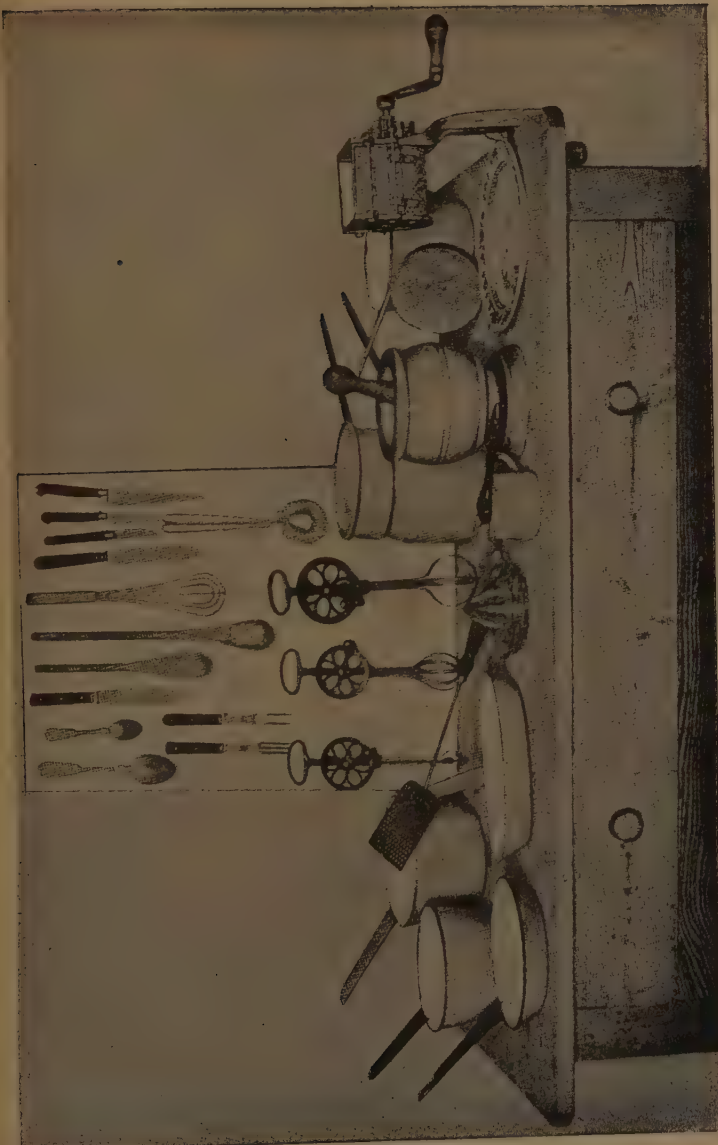
First of all, the probable number of people to be cooked for will govern the size of many of the utensils. Then the style of living will affect the kind as well as the number of utensils needed, and besides these considerations convenience in handling, ease in cleaning, and durability must all be taken into account.

There are saucepans which upset easily; and saucepans with handles with sharp edges, or which grow hot too quickly; saucepans and skillets with lips on only one side, and that the wrong one, so that if one tries to pour from them and stir at the same time, the stirring must be done with the left hand.

Ease of cleaning demands that the utensils be smooth, with rounded sides and no seams or corners, and that they should be wide enough to permit easy access for cleaning. Meat-grinders differ markedly in this respect, some being almost impossible to get clean at all. With larger kettles, weight must be taken into consideration.

Durability depends partly on make and partly on the material used. Saucepans are usually of aluminum, enamel or granite ware, or tin. The so-called tin utensil is steel, or sometimes wrought iron or copper, covered with tin. It is the least expensive of the three types and also the least durable. Cheap grades are easily attacked by the weak acids in fruits and vegetables; even the better grades are not proof against these acids; but tin vessels are light and good conductors of heat. Since tin is sufficiently soft to scratch easily and to wear off, it is better suited for baking pans and bread- and cake-boxes than for saucepans.

Granite or enamel ware is made by coating an iron or steel foundation with a glaze which is not unlike glass in its nature. The quality depends upon the character of the foundation, upon the ingredients of the glaze, and the number of coatings, as well as on the success with which every particle of the metal is covered. The durability is greatly affected by the care that is exercised in using it. Sudden heating or cooling, too vigorous scouring, and dropping, all tend to make the coating crack and chip off, exposing the metal beneath.



A Group of Kitchen Utensils

Aluminum is light, and also a good conductor of heat. It darkens if any alkaline substances are used in cleaning it, and should be scoured inside with fine steel wool, not soaked in washing powders. It is affected slightly by acids, but the experts tell us that the amount dissolved is insufficient to harm us. It warps if subjected to too much heat. However, it makes a durable saucepan and probably justifies its cost.

References

U. S. Dept. of Commerce. Bureau of Standards, Circular No. 55, section on Water, Refrigeration and Ice.

Questions

1. Is the iron used for the top of stoves a good or bad conductor of heat? Does this matter in cooking?
2. Why can you hold your hand for a few moments in an oven whose temperature is above that of boiling water?
3. Which boils more quickly, a new tin kettle or one which is dull on the bottom?
4. Why are the metal bails on cooking vessels often made with wooden handles?
5. Examine a coal range and see whether it has a water-back or a water-front. What makes the water pass from this container into the boiler?
6. Make a diagram of the hot-water system in your school or in a house, and explain the circulation through the pipes.
7. Of what material is the boiler made? What other materials may be used? Is it always wise to use the water from the hot-water faucet for cooking or drinking?
8. Has your boiler a faucet connected with the lower part of the boiler? What is its use?

Home Work

1. What are the materials commonly used in making ice-boxes? Account for their use. Why is the ice compartment at the top instead of at the bottom of an ice-

chest? Next time a cake of ice is delivered at your house find its height, breadth, and thickness in inches with a ruler or tape measure. Multiply these three numbers together to get the cubical content, and divide the result by 30. This will give you its weight in pounds. See if the result agrees with the size of the piece the iceman was supposed to deliver.

2. Clean silver. The easiest way of cleaning it is to boil it as directed below, and if necessary rub any specially stained spots with one of the silver-cleaning pastes or powders.

To Clean Silver.

Place a piece of aluminum in an old kettle or saucepan. A small aluminum cover will do excellently. Put the silver to be cleaned in the kettle on top of the aluminum, cover it with water, and add a teaspoon of salt and one of soda for each quart of water. Bring the water to boiling and let it boil a minute or two, then rinse the silver in fresh water and rub it dry with a soft cloth to polish it. If the kettle itself is aluminum, it is not necessary to add a separate piece, but the silver must touch the aluminum. Since the latter will be blackened in the process, do not use an aluminum article that you care about keeping bright.

XXI

ARRANGEMENTS IN THE KITCHEN AND DINING ROOM

Some Thanksgiving Suggestions	Cranberry Sauce Gelatin Plum Pudding Salted Nuts
Dishwashing	

A. Prepare Gelatin Plum Pudding.

1 tbsp. granulated gelatin or $\frac{1}{4}$ oz. shredded gelatin	Pinch of salt
$\frac{1}{4}$ c. cold water	2 tbsp. raisins, or pieces of figs or dates
$\frac{1}{2}$ c. sugar	1 inch square of citron
$\frac{1}{2}$ square chocolate	8 marshmallows
$1\frac{3}{4}$ c. milk	12 English walnuts

Mix the gelatin and cold water. Add this, with the sugar, chocolate, and salt, to the milk, and heat, stirring until all are dissolved. Pour into a mold and put in a cold place to harden. When it begins to thicken, stir in the fruit, marshmallows, and nuts, first cutting the marshmallows and nuts into small pieces and slicing the citron thin.

To remove from the mold, melt the outside of the jelly slightly by putting around the mold a cloth wrung out of warm water. Serve with plain or whipped cream.

B. Prepare Cranberry Sauce or Jelly.

Pick over the cranberries, wash, and measure. Put into a saucepan with half as much sugar as fruit, and half as much water as sugar. Put the saucepan on the stove, stir until the sugar is dissolved, then cover and cook until all of the berries have burst — about ten minutes.

For jelly, use one-fourth as much water as fruit; boil, covered closely, for twenty minutes, rub through a sieve, add half as much sugar as you had fruit, cook five minutes, and pour into a mold.

C. Prepare Salted Nuts.

1 c. shelled nuts — raw peanuts, almonds, or pecans
$\frac{1}{4}$ c. salad oil

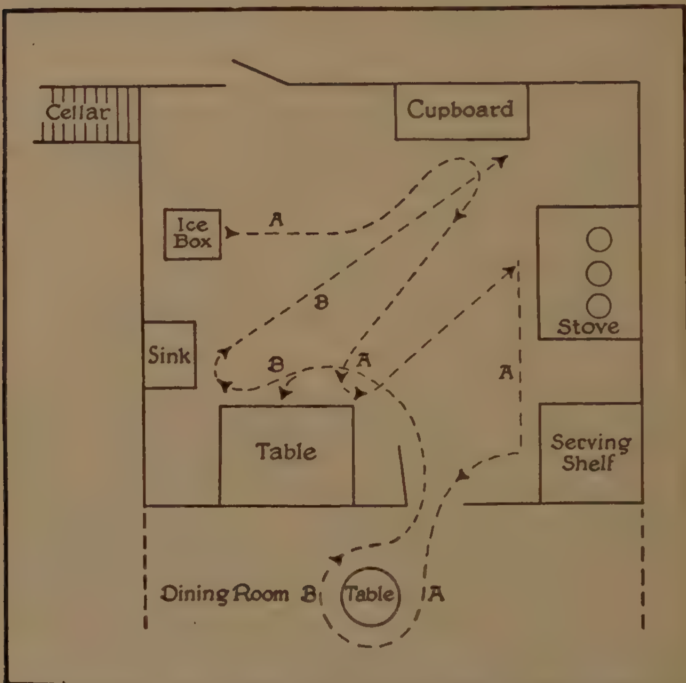
If almonds are used, allow them to stand for a few minutes in boiling water, then slip off the skins, and dry them in a towel. Put the oil in a very small saucepan, heat, and brown about a quarter of the nuts at a time, stirring constantly. In taking out the nuts, remove as little oil as possible. Drain them on clean unglazed paper and sprinkle them with salt. The best way to spread the salt evenly is to shake them back and forth on a piece of paper.

Another method is to dip the ends of your fingers into oil, rub each nut with your fingers, spread the nuts out in a flat pan, and brown them in the oven. It is difficult to brown them as evenly in this way, but it takes less oil — not more than a teaspoonful.

Arrangements in the Kitchen and Dining Room

The old-fashioned kitchen is quite different from our modern one. Originally the kitchen was a living room

in which the preparation of food was carried on as one of many industries. Therefore, when the room was in order, everything pertaining to cooking was, as far as possible,



From "You and Your Kitchen", by Mrs. Christine Frederick.

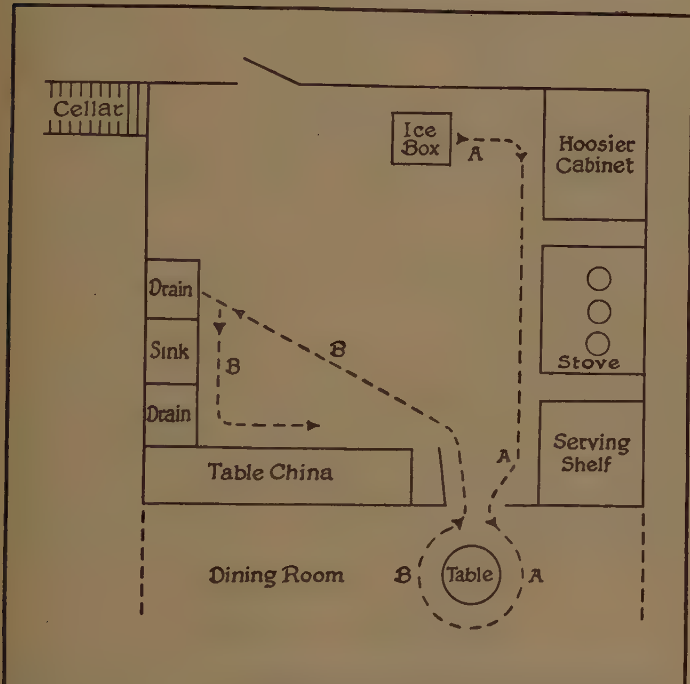
Floor Plan of a Poorly-Arranged Kitchen

A. Steps taken in the preparation of a meal. B. Steps taken in clearing away.

put out of sight. Now, the kitchen is a workshop for the serving of food and need be adapted only for that use, and may show frankly the use for which it is intended.

Arrangement of Stove, Sink, and Table

To save both time and steps, the stove, sink, and table must be near each other. Picture to yourself the going to



From "You and Your Kitchen", by Mrs. Christine Frederick.

Floor Plan of the Same Kitchen, Properly Arranged

and fro which is necessary in the cooking of a meal, and the advantage of a small kitchen is at once obvious.

In the preparation of a meal, food which is ready to go to the dining room is taken from the stove, placed in serving dishes, and carried into the other room. Therefore a serving table should stand between the stove and the door

into the dining room. This need not be a large table; it may be only a shelf, even a folding shelf. It may very conveniently be covered with galvanized iron or zinc, because then hot dishes and kettles can freely be set on it.

On the other hand, a table on which food is prepared for cooking should stand next to the stove and near the storage cupboard and ice-box. These need not necessarily be in one straight line. Note the accompanying illustrations (floor plans of kitchens). In a large kitchen, it is often a great help to put a table in the middle of the room.

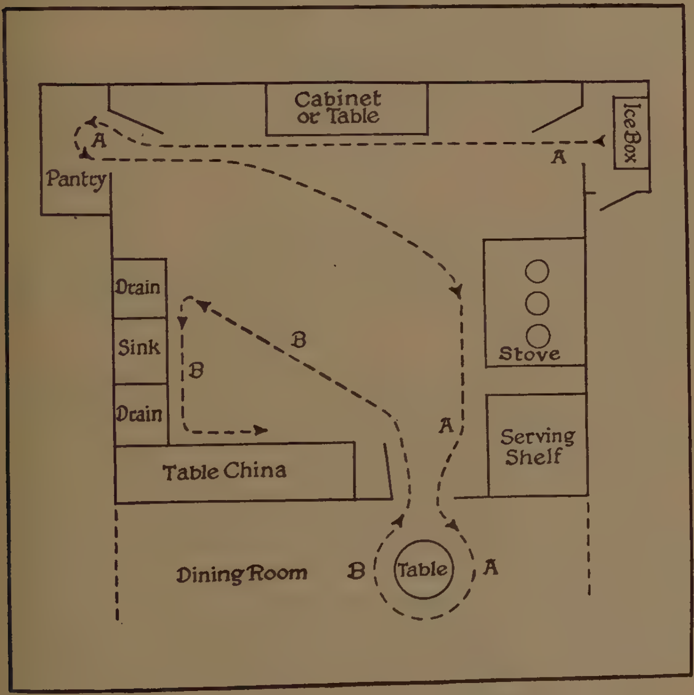
For washing dishes, the drain boards and china closet should be near the sink. But, obviously, water will also be needed in mixing food, and in cooking it. The best way, then, to bring the sink near all these is to place it opposite the stove.

This sort of arrangement of work is called "routing" it. Unfortunately the positions of the stove, sink, and closets are often determined by the architect, with little or no regard to the convenience of the worker. But thought and ingenuity in putting up shelves and cupboards can do much in transforming an inconvenient kitchen into a more convenient one.

Choosing Places for Utensils

Nor are these larger arrangements the only ones to be thought about. Quite as much saving of time can be made by the proper placing of utensils and supplies. Think where any given article is used most and keep it near that place. For example, soap, scouring powder, silver polish, as well as the dishpan, dish-mop, and the like are all used in the sink. Store them so that they are within immediate reach. Some may hang from the wall behind the sink, or from the edge of a small shelf placed above

and a little to one side of the sink. Compare the convenience of this with the practice, for example, of carrying the dishpan, often every time it is used, across the kitchen and standing it in a pantry closet.



ANOTHER WELL-ARRANGED KITCHEN

Certain supplies should be kept near the stove, as well as spoons and other utensils to be used there. Of course nothing which is not used frequently should be stored in the kitchen. Other things are better put away in cupboards or in the pantry. If the kitchen is dusty, as when a coal range is used, open shelves may be replaced by cupboards,

or by curtained shelves protected by a window shade which will roll up. Narrow shelves with articles only one row deep are much more convenient than wider shelves where the articles in front must be moved aside to give access to those behind. Plan never to hang one article over another on the same hook.

Apply these same principles to the arrangements of the dining room. Evidently salt and pepper shakers, sugar bowls, napkins in use, and other articles used only at the table should be stored as near it as possible. But what about serving dishes? If these are kept in the dining room, they must be taken to the kitchen, filled, brought back, used, carried out, washed, and brought back again for storage, only to be carried out to the kitchen again before using. This evidently is not efficiency.

Planning of this sort is really very useful. Time studies are often made to determine which is the quickest way of carrying on a given process, or to see how much time is saved by a better arrangement. Noting the exact time it takes to do a given task by one method, and then the exact time necessary in another way, shows the difference in the two much more accurately than a mere impression of the difference. Surely, the ideal is not to spend one's whole time doing housework, but to do it as quickly and efficiently as possible, so that one may have time for the larger things of life.

References

U. S. Dept. of Agriculture. Dept. Circular No. 189. "The Well-Planned Kitchen."

"The Efficient Kitchen", by Georgie Boynton Child.

"The New Housekeeping", by Christine Frederick.

Home Work

1. It is interesting to make time studies of dishwashing. For several days, see how long it takes to wash the dishes for dinner or supper, and average the time spent. Then try some other method and see if you can save any time. If you do not have a dishwashing machine, the following method is considered the quickest as well as the most sanitary way of washing dishes.

Dishwashing.

Scrape the dishes and pile like kinds together on the drain board or on a table at one side of the sink. Wash the dishes in plenty of good, hot, soapy water and stand them in wire dish-drainers which are arranged so that each dish is held separately. Even the inexpensive wire drainers serve the purpose admirably. Pour scalding hot water over the dishes and let them dry. If they are not dry in about fifteen minutes you are not getting them hot enough. You can carry the dishes in the drainer to the china closet. Glasses will have to be rinsed and wiped, and most people prefer to wipe their silver also.

2. One of the best ways of saving time is not to use too many dishes in the preparation of food. A mixing bowl or a spoon which has been put in food, but not used in tasting, can be rinsed off and used again immediately. Another good way is to put the dishes that are soiled into water immediately. Soaking will prevent the drying on of the food, and the dishes will need far less scrubbing to clean them. In this way you will keep your kitchen "cleared up as you go", and the lack of confusion will in itself enable you to find what you need and to work quickly. Finally, using your head by planning before you begin work will save much time and labor. Think

of all the utensils and supplies you are going to need and collect them as far as possible at one time. The heedless person does much unnecessary rushing around. Next time you work in the kitchen try to think of all these things. Remember that it takes some time to form habits, but a good habit once formed is invaluable.

3. See what you can do to help out with the Thanksgiving dinner. All the suggestions in this lesson are for things that can be made a day ahead and can be out of the way before the main part of the dinner has to be cooked.

XXII

RECEPTION OR AFTERNOON TEA

Candied Fruit Peel
Marguerites
Sandwiches
Cinnamon Toast

Hold a Reception.

Probably your mothers would enjoy coming to meet your teacher and the others in the class.

Prepare bread-and-butter or jelly sandwiches, candied fruit peel, and marguerites or marshmallow crackers, cocoa or tea, or coffee, as desired.

1. Candied Fruit Peel.

Wash and remove the skin of an orange or grapefruit. Boil in water until tender. If the peel is very oily, the water may be changed during the process. When the peel is soft, cut it into even, narrow strips. Make a syrup, using half a cup of sugar and an equal amount of water. Add the peel and cook until the syrup is nearly evaporated, stirring constantly. Drain the peel and roll it in granulated sugar. Let it dry for some hours before serving.

2. Marguerites.

12 wafers
1 egg white
$\frac{1}{2}$ tsp. salt
2 tbsp. powdered sugar
$\frac{1}{4}$ tsp. vanilla
$\frac{1}{2}$ c. chopped nuts or raisins, or the two mixed

Mix the salt with the egg, and beat until very stiff. Add the other ingredients, and spread on wafers. Heat in a moderate oven until a delicate brown.

3. SANDWICHES.

In cutting bread for sandwiches, cut the slices as thinly and evenly as possible. If the butter is creamed before using, it will spread more easily. After the slices are put together, you may cut off the crusts or not as you prefer. Usually for afternoon teas the crusts are removed and the sandwiches are cut into squares, oblongs, or triangles. Sandwiches cut in rounds are rather wasteful, unless the original loaf was a cylinder. In order to prevent drying, sandwiches should be wrapped in a dry cloth with a damp one outside, until just before serving.

RECEPTIONS

Going to a reception sometimes seems a formidable undertaking to one not used to it, but in reality it is a simple affair for the guest.

Invitations and Replies

If the reception is formal and the invitation "requests the pleasure of your company", a reply must be sent in like form. But if the reception card is informal, as that for an

Miss Smith
Mrs. Blank
At Home
November the eighth
4–6 P.M.

"at home", unless the invitation says "please reply" (or "R.S.V.P.", which is an abbreviation for the French words meaning the same thing), it is not necessary to respond. If you cannot go, either mail your calling card so that your hostess will receive it just before the reception, or ask some one who is going to leave your card for you. If more than one name appears on the invitation, a man sends one calling card for each person, a woman one for each woman, but all are merely enclosed in the one envelope and directed to the hostess. Nothing is written upon the cards.

Dress and Behavior

The guest may appear at any convenient time during the hours set. Hats are worn at an afternoon reception, but coats are ordinarily removed. Hats are not worn at an evening affair.

The guest shakes hands first with the hostess, then with any others who may be standing with her. Whether any chatting may be done depends upon the number of guests waiting for a chance to speak to the receiving line. After mingling with the others for a few moments, one may be invited to go to the dining room, or in the case of very informal affairs left to find one's own way out. After being served, one may chat again with friends, or go directly to the receiving line to say good-by, and express one's pleasure. Before leaving the house, cards are left, the same rules applying as if they were sent.

An invitation to a reception is supposed to necessitate a call upon the hostess afterwards, but at the present time this rule is generally disregarded unless the invitation has not been accepted.

The hostess is busy receiving her guests, so that it is necessary that she be relieved of other cares. At informal

affairs friends are asked to pour at the table or to serve, sometimes to invite to the dining room. Those assisting do not wear hats. In some places it is a pretty custom to pin favors, a flower or a knot of ribbon, on each guest as he is served, so that no one shall be overlooked.

Serving Refreshments

Unless the reception is very informal, the refreshments

TEA-TRAY SET

will be served from a dining table. Some one seated at one end of the table may pour a beverage, as tea, coffee, cocoa, or fruit punch. The filled cup or glass, with a teaspoon, if needed, is placed on a plate and is passed, with a napkin, to the guest by some one who is serving. Sugar, cream, lemon, sandwiches, and later cakes and candies may be offered. As soon as the guest has finished he should be relieved of the napkin, cup, and plate. Guests should not linger in the dining room if others are waiting to be served.

References

"Sandwiches", by Mrs. Rorer.
"Salads, Sandwiches, and Chafing Dish Dainties", by Mrs. J. M. Hill.

Questions

1. What is the chief difference in the arrangement of the table for a meal and for a reception?
2. If you were instructing a person ignorant of how to behave at a reception, what points would you make?
3. Write a formal invitation and acceptance for a reception.
4. Under what circumstances do you send a card to a reception? When do you leave a card?

Home Work

If your mother has callers some afternoon, she may be glad to have you prepare and serve afternoon tea. In this case, the tea is brought in on a tray and set on some convenient table, or wheeled in on a tea-cart. Dainty sandwiches, fancy crackers, cinnamon toast, or cake may accompany the tea. In this country, afternoon tea is not a regular meal and, as it is served chiefly for sociability, only very light refreshments are offered. It would be proper for you either to pour and serve the guests, or to place the tray where your mother can pour, and then pass the things to the guests for her.

Cinnamon Toast.

Cut stale bread in thin slices, remove the crusts, and then cut in diamonds or oblongs. Toast the bread, then sprinkle it with sugar and cinnamon, using about three times as much sugar as spice, and then put the toast in the oven just long enough to melt the sugar.

XXIII

MEDIUM WHITE SAUCE

Creamed Chipped Beef
Creamed Potatoes
Potatoes au Gratin
Creamed Eggs
Cream Toast

A. **Class Experiments.** Starch.

1. Boil a pinch of starch with about a tablespoon of water; cool and add a drop of iodine. Recall the test on potato. Repeat, using flour instead of starch.
2. Methods of mixing starch and hot liquids:
   a. Stir a teaspoon of cornstarch or flour into half a cup of boiling water and note results. Break a lump and examine the inside.
   b. Pour half a cup of boiling water on a teaspoon of starch or flour. Does it still lump?
   c. Mix a teaspoon of flour or starch with a teaspoon of sugar, then pour on half a cup of boiling water. Result?
   d. Mix a teaspoon of starch or flour with a little cold water, making a smooth paste, and pour this into half a cup of boiling water, stirring. Result?

e. Melt a teaspoon of fat, add a teaspoon of flour or starch, stir thoroughly, and then pour in gradually half a cup of boiling water, stirring as you pour.

In what ways could you successfully mix flour, butter, and hot milk, to make a white sauce?

B. PREPARE WHITE SAUCE, MEDIUM THICK.

2 tbsp. butter or oleo	1 c. milk
2 tbsp. flour	$\frac{1}{4}$ tsp. salt

Melt the butter in a saucepan, stir in the flour, and then add the milk gradually, stirring constantly. Omit the salt, because of the use to be made of the sauce in *C*. Boil until it thickens. Learn these proportions.

C. PREPARE CHIPPED BEEF ON TOAST.

Shred the beef into pieces, cover with hot water and let stand a minute to remove some of the salt. Then drain, and re-heat the beef in the sauce made in (*B*). Add salt, if needed.

WHEAT

Importance of Wheat as a Cereal

In this country wheat is of greater importance as a food for man than is corn or any other of the cereals. Rice is so largely used in eastern countries, China, Japan, and India, that possibly more rice is used as food, taking the world at large. In England, Hutchison estimates, the people consume wheat at the rate of six bushels for each inhabitant; in America, Sherman concludes, the amount used is even greater, as high as six and a half bushels per person. As America has not only the proper conditions of climate,

but the necessary acres on which to grow it, wheat is an important agricultural product, the United States

Wheat Fields

exporting it in large quantities. More corn is actually grown, it is true, but more of this is used on the farms for cattle food, so that the wheat crop is first in commercial importance.

Winter and Spring Wheat

Wheat is classified as "hard" or "soft", according as its gluten content is high or low; as "winter" or "spring", according to the season in which it is planted. In localities where the winter is not too severe, wheat is planted in the fall and allowed to winter in the ground, maturing early in the summer. Spring wheat is not planted until the winter is over and, consequently, matures later in the season.

The character of the wheat differs with the variety and the locality where it is grown, but, in general, winter wheat contains more starch and is "softer" than spring wheat, which is usually preferred for making bread flour. The percentage of gluten is not, however, the only thing to be considered, for the quality of the gluten is of even greater importance than the amount.

Durum wheat, a very "hard" variety, is used for the manufacture of macaroni, spaghetti, or vermicelli. These are manufactured by forcing the flour, mixed with water to form a stiff dough, through holes in the cover of a steam-heated cylinder. In Italy, the shaped paste is hung on rods to dry, sometimes in the air, sometimes in ovens. It is claimed that in America greater care is taken during the drying process to protect the paste from dust. Good macaroni should be cream white, should break without splitting, should not lose its shape, and should swell to about three times its bulk when cooked.

References

U. S. Dept. of Agriculture. Exp. Sta. Bulletin No. 200. "Courses in Cereal Foods."

"Food Products", by H. C. Sherman. 2d ed., pp. 294–295.

Questions

1. Why do we cook starch?

2. What are the proportions for making an ordinary white sauce? These are used so often they should be learned thoroughly.

3. Review the different ways in which white sauce can be successfully put together. Give instances in which you think it would be advantageous to use each of these methods.

4. If you are making a small amount of white sauce by the melted-butter method, cold liquid may be added. If you are making large amounts it is wiser to use hot liquid. Account for the difference.

Home Work

1. Find out what sort of wheat is grown in your locality — hard or soft.

2. Here are some simple white-sauce recipes which you can try at home:

Creamed Potatoes.

2 c. fresh-boiled potatoes cut in small cubes
2 c. medium-thick white sauce

Make the white sauce and re-heat the potato in it. If left-over potatoes are used, make three cups of white sauce and warm the potatoes in the sauce in a double boiler for half an hour.

Potatoes au Gratin.

Put creamed potatoes in a greased baking dish. Sprinkle over the top buttered crumbs and bake until

brown. For buttered crumbs, use a half cup of bread, at least a day old, broken into small pieces, or staler bread rolled into finer crumbs. Melt about two teaspoons of butter in a saucepan, stir in the crumbs, and season them with salt and pepper if desired.

CREAMED EGGS.

6 hard-cooked eggs	$1\frac{1}{4}$ c. white sauce

Cut the eggs into small pieces and re-heat in the sauce. If desired, a little soft cheese may be cut into small pieces, or grated if it is hard, and stirred into the sauce when the eggs are added.

Creamed eggs are often served on slices of toast.

CREAM TOAST.

6 slices of toast buttered	2 c. white sauce

Pour the hot white sauce over the toast in a deep dish and serve at once. If you wish, you may stir some cheese (see recipe above) into the sauce before you take it from the fire.

XXIV

BREAD FLOUR

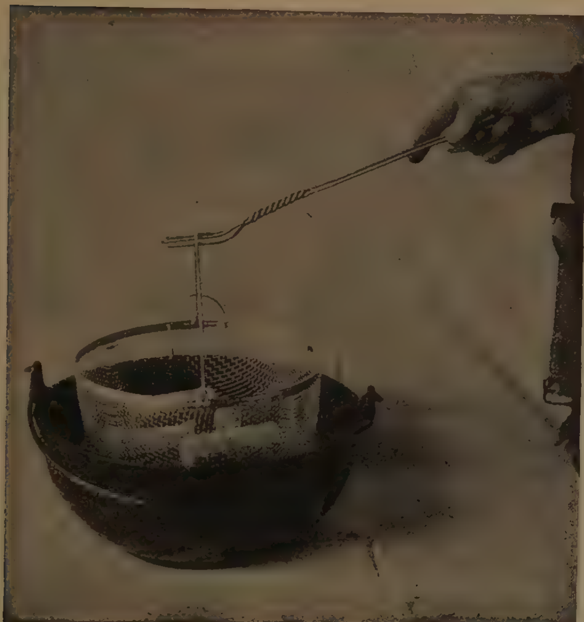
Thick White Sauce
Salmon Croquettes
Cheese Soufflé

A. Prepare Salmon Croquettes.

Make a thick white sauce, using the proportions of four tablespoons of flour, and two tablespoons of butter, to one cup of milk. Add one-fourth of a teaspoon of salt.

Use half of the white sauce to prepare salmon croquettes, using about twice as much fish (flaked) as sauce. Season with lemon, salt, and paprika. Spread on a plate to cool, shape, then dip in crumbs, in egg (beat an egg slightly with a fork, add two tablespoons of water), and in crumbs again. Fry in deep fat. When fat will turn a piece of bread a golden brown in forty seconds, it is the right temperature for frying food that is already cooked. Find out, with a thermometer, what temperature this is. (Be careful to wipe off the thermometer, but do not wash until cool for fear of breaking.) Drain the croquettes on absorbent paper, and do not pile on top of one another while hot.

The crumbs for croquettes may be prepared as for use in scalloping, and the croquettes may then be baked



FRYING CROQUETTES

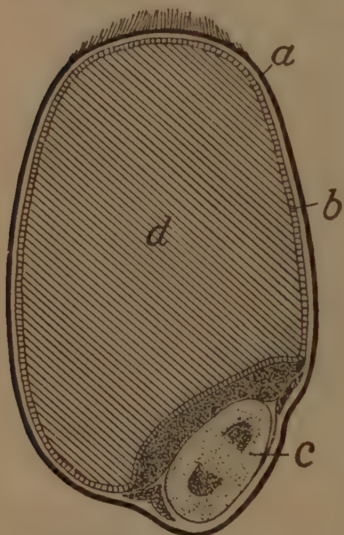
instead of being fried. This is a safer and easier process because in deep-fat frying there is considerable danger if the fat takes fire. With the exposed flame of a gas stove, special care should be taken.

B. PREPARE CHEESE SOUFFLÉ.

Use the rest of the white sauce to prepare cheese soufflé. Add to the white sauce one and a half tablespoons of grated cheese, a little paprika, and half the beaten yolk of an egg. Then fold in half the stiffly-beaten white of an egg. Bake in a buttered earthenware dish placed in a pan of water. Serve at once.

Bread Flour and Its Manufacture

The wheat kernel consists of a number of different parts. The outside layers are known as bran and are mostly removed in the process of making white flour. This bran consists of cellulose and mineral matter, with a higher percentage of nitrogen than is found in white flour; but as this nitrogen is found largely in the aleurone or inner layer of the bran, where it is enclosed in thick-walled cells, it is doubtful if we digest much of it when we eat the bran unless it is finely ground. The germ is rejected in making white flour and most of the wheat breakfast foods, because it contains so large a percentage of fat that flour containing it would be less likely to keep. The portion of the kernel, after the bran is removed and without the germ, is known as the endosperm.



Grain of Wheat

Diagram of section: *a*, bran; *b*, aleurone layer; *c*, germ or embryo; *d*, endosperm.

White Flour

The endosperm is the portion which is ground to make white flour. It constitutes about eighty per cent of the whole kernel and contains a large percentage of starch, — about seventy-five per cent — besides nearly twelve per

cent protein, about one per cent fat, and half of one per cent of mineral matter. It is curious to note that even so dry a substance has about thirteen per cent of water present.

The length of the process of making flour varies in the different mills. In the old process, the wheat kernels were ground between millstones, the crushed product was sifted first through coarser material to remove the bran, next through bolting cloth to remove the material of intermediate size which was called middlings. What went through the bolting cloth was flour. Now, after the wheat has been screened to remove foreign substances and cleaned, it is put between corrugated rollers which flatten and partially crush the kernels, producing a small amount of flour. This is known as the first break. After the flour has been sifted out, the rest is again crushed between rollers which are this time a little closer together. These processes are repeated, some mills using so many rollers and sieves that there may be forty different "streams" of flour from the grinding. These "streams" are finally mixed together to form the various grades of flour desired.

Gluten

The characteristic proteins in wheat are usually spoken of as glutens. These are really, however, two different proteins, the one named gliadin, giving tenacity and elasticity to the gluten, while the other, glutenin, gives strength. They must be present in proper proportions to give a gluten which is desirable for bread-making, and flour manufacturers test the gluten by a baking test to be sure the flour will make good bread. About nine-tenths of the protein in white flour is gluten.

As has already been said, those brands of flour which

are made from spring wheat often contain more gluten than do those that are made from winter wheat, and are usually preferred for bread-making.

This distinction between spring and winter wheat is by no means universally true. Hard winter wheat of high quality for bread-making has been grown for some years in several localities.

References

Booklets and exhibits sent out free by well-known flour mills.
"Food Products", by H. C. Sherman. 2d ed., pp. 299–304.

Questions

1. Why does the soufflé puff up?
2. Why is it baked in a pan of water?
3. Describe the different parts of the wheat kernel.
4. Describe the process of making white flour.

Home Work

1. Measure the number of cups of flour there are in a pound.

2. What are the trade names of some of the best-known, high-grade flours? What does the same grade of flour cost by the pound, the bag, and the barrel? How many pounds are there in a barrel of flour? In a bag? Is it cheaper to buy flour by the barrel, bag, or pound?

3. If possible, visit a flour mill.

4. Make some baked croquettes.

XXV

STARCH

Cornstarch Mold
Macaroni and Tomato Sauce
Macaroni and Cheese

A. **Class Experiments.**

1. Mix a tablespoon of flour with a cup of cold water and heat, stirring constantly, until the mixture has boiled two minutes.

2. Repeat, using cornstarch in place of flour.

What is the comparative thickening power of flour and cornstarch?

B. Cornstarch Mold.

Make a cornstarch mold, using two cups of milk, two to four tablespoons of sugar, a salt-spoon of salt, and as much cornstarch as would give the consistency of the thick white sauce used in the last lesson. How will you combine the ingredients? Cook five minutes over the fire, stirring constantly; then cook covered, over water, until the "raw" taste has disappeared. This will take at least fifteen minutes. Remove from the fire, add a quarter of a teaspoon of vanilla, pour into a wet mold, and let stand until cold. Serve with chocolate sauce.

Chocolate Sauce.

Melt half a square of chocolate with half a teaspoon of butter. Add a third of a cup of water, a cup of sugar, and a few grains of salt. Boil until moderately thick; cool, and flavor with a few drops of vanilla.

C. Prepare Macaroni and Tomato Sauce.

Boil until tender half a cup of macaroni broken into inch pieces in a quart of boiling water with a teaspoon of salt. Drain and pour some cold water over it to prevent the pieces from sticking together. Re-heat in an equal amount of tomato sauce. Make this as you would white sauce, but use the juice from canned tomato for the liquid. Since macaroni is starchy, use a proportion of flour that will make a sauce between thin and medium.

Cornstarch

The manufacture of cornstarch is interesting because so many other products are made at the same time.

Manufacture of Cornstarch

First the corn is cleaned, then it is soaked or steeped in warm water for a couple of days. In order to prevent its spoiling, a little sulphurous acid is added. When the corn is sufficiently swollen, it is ground coarsely so as to break up the kernel without breaking the germ.

The germ is so rich in both protein and fat that it is most easily taken care of by itself. All that is necessary to separate it after the grinding is to run the ground mass into separators, when at a certain density of the liquid the germ, light on account of its oil content, floats on top of the water, while the ground hulls and starch settle and are drawn off from the bottom.

The next problem is the separation of the starch from the hulls. It is necessary to grind the mass up much more finely than before; then the semi-liquid is passed over sieves of bolting cloth with a 200 mesh, which is shaken mechanically so that the particles of the hull are sifted out, the starch itself passing through. The hulls are separated, re-ground, and re-sifted, and sprayed with water during the process, in order to get out all the starch possible.

The starch and water that goes through the sieve, however, is still mixed with protein. This liquor, at just the right density, is passed over long tanks with slightly inclined bottoms. As it flows, the starch settles and rolls along the inclined surface, thus washing itself.

But after all the processes the starch has gone through it is still crude, and for use as cornstarch must be still further refined. This so-called "green starch" still contains too much protein, so that it is again washed, sometimes with water alone, sometimes with dilute alkali.

Other Products

The water containing the protein is usually mixed with the hulls and the dried product is used for feed for cattle. The separated germ is pressed to extract some of the oil. Corn oil is used as food only to a small extent, but it is used for making soap and in other industrial processes. The germ with the oil partly expressed is mostly exported to Europe as oil-cake, and is used for feeding stock.

Often the plant which separates all of the direct products of corn also manufactures dextrine, corn syrup, and glucose, using "green starch" in the process.

Some Characteristics of Cornstarch

Cornstarch is less difficult to mix with liquids than is flour, because it does not contain the gluten which flour

does. When hot water is poured over starch, it gelatinizes the starch with which it comes into contact. The starchy grains form a mass which is impervious to water and so prevents the water reaching all of the starch grains. This can be prevented by mixing some other substance with the starch before pouring on the water, because the other substance separates the grains and gives them room to swell without sticking together. As raw starch is both less digestible and much less palatable than cooked, prevention of lumping is important.

In spite of all the purifications cornstarch has undergone in its manufacture it has a characteristic flavor which everyone readily recognizes and which must be due to some other substance mixed with the starch. Only after long cooking does this flavor disappear.

Questions

1. Give two reasons why, in making the pudding, the cornstarch is covered during the long cooking.
2. Why does cornstarch require so much longer cooking than flour?
3. If you were to make a large amount of cornstarch pudding, why would you not mix the cornstarch with all the cold milk? How would you proceed?
4. How does a sauce thickened with cornstarch differ in appearance from one thickened with flour?
5. Since sauces are not cooked a long time, would you choose cornstarch to thicken a sauce which was not highly flavored? Why?
6. How does laundry starch differ from cornstarch used for cooking?
7. Why is laundry starch in Europe manufactured from potatoes and not from corn?

Home Work

1. How do macaroni, spaghetti, and vermicelli differ? Find out from a dictionary what the names mean. Study

the cost of various macaronis to be found in your markets. Do cost and quality correspond?

2. Consult cook books and make a list of ways in which macaroni may be served. Prepare macaroni and cheese.

BAKED MACARONI AND CHEESE.

$\frac{3}{4}$ c. macaroni	$\frac{1}{2}$ to $\frac{3}{4}$ c. grated cheese or about 1 cube cut in small pieces $\frac{1}{4}$ inch
$1\frac{1}{2}$ c. medium white sauce	2 c. buttered crumbs

Cook the macaroni in salted water. Use some of this water as half the liquid for the white sauce, and reduce slightly the amount of salt usually added. Stir in the cheese and the macaroni, put in a buttered dish, cover with buttered crumbs, and bake until brown.

XXVI

CANE AND BEET SUGAR

Sweet-Flavored Vegetables

Squash
Buttered Beets

A. Squash.

Prepare squash, boiled, steamed, and baked. Compare the time of cooking, the texture, and the flavor.

Boiled Squash.

Cut the squash in pieces, pare, and remove seeds and strings. Cook in boiling, salted water, until soft. Use one teaspoon of salt to one quart of water. Drain, mash, and season with salt, pepper, and butter.

Steamed Squash.

Follow directions under boiled squash, except that, instead of boiling the squash, you should cook it in a strainer over boiling water.

Baked Squash.

Prepare squash by cutting in squares and removing seeds and strings, but do not pare. Bake until soft.

B. BEETS.

1. Wash a beet and cut the top off close. Cook in hot water until tender.
2. Wash a beet as before, but take pains not to break the skin; retain the root and at least an inch of the top. Cook as before. Compare results. When should beets be peeled, before or after cooking? To serve, peel and cut beets in half-inch slices and re-heat in a little butter; season with salt, and pepper if desired.

C. **Class Experiment.** SUGAR TEST.

Very dilute copper sulphate and potassium hydroxide solutions are used in testing for sugar.

1. Boil together a little of the two solutions, and note the color obtained when no sugar is present.
2. To a few drops of glucose, add a little of the two solutions and boil. (Corn syrup may be used.) What is the color when sugar is present?
3. See if you can obtain this color by using granulated sugar in place of the glucose.
4. Boil a little granulated sugar with some acid in the water. (Cream of tartar or vinegar may be used.) Now try the sugar test, but before boiling, be sure to add enough of the hydroxide to color the solution blue and not green.
5. Boil small pieces of vegetables or fruit, such as beet, onion, sweet potato, grape, apple, prune, or date, with water, and then test the water for sugar. If the test is not obtained at once, try boiling first with acid, and then making the test.

Cane and Beet Sugar

If you talk to the ordinary person about the different kinds of sugar, he will probably think of lump, granulated, powdered, brown, and even maple sugar, and think that this is what you mean by the different kinds. But if you ask a chemist he will tell you that all these are really only different forms of one kind of sugar, which he will call cane sugar or sucrose.

Sucrose is found in large amounts in sugar cane, but it is also found in considerable quantities in the sugar beet, as well as in the sugar maple and the sugar palm.

Manufacture of Cane Sugar

In the manufacture of sugar from sugar cane, the cane is crushed and the juice squeezed out by passing between a series of rollers while the pulp is sprayed with water. This gives what is called raw juice.

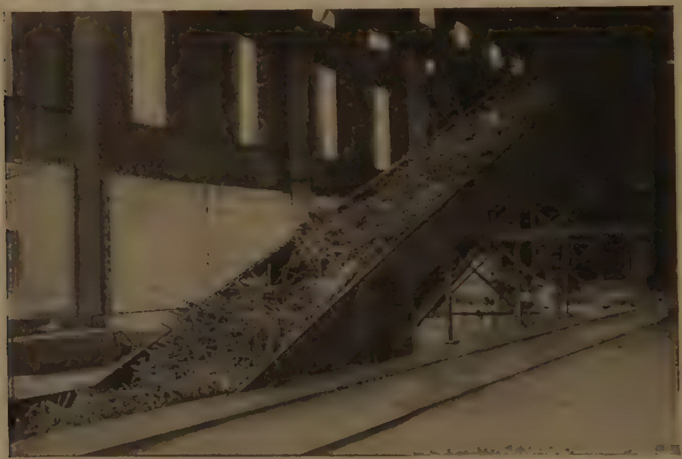
The separation and refining of the sugar in this juice is sometimes carried out by one process, sometimes by another. Lime is often used to neutralize the acidity of the juice, impurities are filtered off or allowed to settle, and the residue is boiled repeatedly, sugar crystallizing out after each boiling. In modern factories, this last process is accomplished in vacuum pans. As a result raw or brown sugar is obtained. Brown sugar requires still further purification to make it white. It is washed with sugar syrup, dissolved in hot water, clarified, and filtered first through cotton bags, then through bone-black filters, to remove as much of the color as possible, and again crystallized in vacuum pans.

When we study in detail all the processes which sugar goes through, and all the machinery which is used in its

A Field of Sugar Cane
The source of one of our important foods

manufacture, it seems marvelous that sugar can be sold for a few cents a pound.

Sugar from beets is manufactured by similar processes, but the juice is soaked out instead of being crushed out of the beet. As found on the market, the crystals of sugar from the one source are sometimes coarser than from the other, but the two are exactly the same kind of sugar.



Courtesy of United Fruit Company

SUGAR CANE BEING CONVEYED TO CRUSHERS

The United States produces sugar in large quantities, but more from cane than from beets. Europe, on the other hand, makes beet sugar.

Different Forms of Sucrose

Granulated sugar is crystallized beet or cane sugar. When this is crushed, powdered sugar is obtained. As powdered sugar is likely to "cake", it is sometimes mixed with a little flour or cornstarch to absorb any moisture which would be likely to make it lump. If the sugar is ground very fine, it is called confectioners' sugar.

Granulated sugar is practically one hundred per cent pure, but brown sugar contains some ash and moisture. It is graded according to whether it is light or dark in color, coffee sugar being lighter than "old-fashioned" brown sugar.

Molasses

Ordinary molasses is the by-product of the manufacture of cane sugar. It contains some acid and mineral matter, and about twenty per cent water, but is still almost sixty per cent sugar. Only about half of this sugar is cane sugar. Sorghum, sometimes called sorghum molasses because of its resemblance to real molasses, is a syrup made from the sorghum plant.

Refined sugar could also be manufactured from the sap of the sugar maple, although not very profitably, for the amount of sugar present is small; but because the taste of the raw sugar is agreeable, maple sugar, as such, is put upon the market and obtains a good price.

Sugar in the Diet

The amount of sugar used yearly is large, — in the U. S. between 95 and 100 pounds per person — but it is only recently that sugar has been used freely, and it is still an open question whether such extensive use is desirable. Sugar not only lacks mineral salts and vitamins, as has already been pointed out, but it shows some tendency to cause indigestion. In too great concentration, it abstracts water from the mucous membrane. Sherman suggests that this effect is easily illustrated by holding a piece of hard candy in one side of the mouth for some time, without moving it. Then, too, sugar readily ferments in the stomach, and forms irritating acids. On the other hand, sugar is quickly digested and furnishes an immediate source of energy.

In the household use of sugar, it should be remembered that the best time to eat sugar or candy is after meals. If eaten in staple food, it often causes more to be eaten than is needed, or by cloying the appetite, produces the opposite effect. Taken between meals, it may upset the normal appetite. It is less likely to irritate the stomach if taken with other food. Liberal amounts of water tend to lessen the irritation.

Sugar is a hearty food and if it does not produce digestive disturbances, can undoubtedly be used in larger quantities by very active people, hard laborers, and children, than by sedentary people. It is often carried by soldiers or mountain climbers because it is a concentrated food.

References

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Farmers' Bulletin No. 653. "Honey and Its Use in the Home."

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Commercial geographies and atlases.

Questions

1. What are the dangers in eating too much sugar?
2. When is the best time to eat candy? Explain why.
3. If sugar were adulterated with either sand or starch, how would these be easily detected?
4. Where is sugar produced? Do we export or import sugar? Do we use more cane or more beet sugar?

Home Work

1. What different kinds of lump sugar can you buy? Which costs most by the pound, granulated or lump sugar? What does maple sugar cost?

2. When you wash dishes, notice whether there has been any amount of sugar left in the bottom of the cups. Why do many people consider it less expensive to serve lump sugar with beverages? Which do you think your family would find cheaper?

XXVII

CARBOHYDRATES

CANDIES

PEANUT BRITTLE
CHOCOLATE FUDGE
VANILLA CARAMELS
POPCORN BALLS
GLACÉ FRUIT AND NUTS

A. **Class Experiments.**

THE STAGES IN SUGAR COOKERY.

Boil ½ c. sugar in ¼ c. water. Test by dropping a sample of the product into cold water at the following stages. Feel the ball in 2, 3, 4, and 5. Note color in 6 and 7.

1.	238° F.	"Thread"
2.	236–242° F.	Soft ball
3.	254° F.	Hard ball
4.	260–275° F.	Crack
5.	290° F.	Hard crack
6.	320° F.	Barley sugar
7.	290–390° F.	Caramel

B. PREPARE PEANUT BRITTLE.

2 c. granulated sugar
¾ c. chopped peanuts
¼ tsp. salt

Heat the sugar in an iron pan over a low flame and stir constantly until it is a light brown syrup. Pour it over the peanuts spread in a buttered pan. Mark in squares as it cools.

C. **Class Experiments.** CRYSTALLIZATION OF SUGARS.

Dissolve $\frac{2}{3}$ c. sugar in $\frac{1}{4}$ c. water. Divide into 3 portions.

1. Boil first portion to hard-crack stage, and set aside to cool.
2. To the second portion add $\frac{1}{2}$ tsp. vinegar or lemon juice or a pinch of cream of tartar. Boil to hard crack stage and set aside to cool.
3. To the third portion add one-fourth the volume of glucose. Boil to hard-crack stage and set aside to cool.

Why is acid or glucose added in making many candies?

D. CANDIES.

Make such candies as time and circumstances warrant. Cook to:

1. Soft-ball stage (238°) Panocha, Fudge, Cocoanut Cream Candy, Fondant.
2. Hard-ball stage (254°) Caramels, Plantation Drops, Buttercups, Sea Foam.
3. Crack stage (270°) Molasses Candy, Ice Cream Candy, Vinegar Candy, Popcorn Balls, Butterscotch.
4. Hard-crack stage (290°) Glacé-Fruits and Nuts.

1. CHOCOLATE FUDGE

2 c. sugar	2 oz. chocolate
$\frac{1}{2}$ c. milk	2 tbsp. butter
$\frac{1}{2}$ c. corn syrup	$\frac{1}{4}$ tsp. salt

1 tsp. vanilla

Boil the ingredients together gently until soft-ball stage is reached. Cool, beat until mixture is thick, add vanilla, and pour into a buttered pan. Cut in squares.

2. Vanilla Caramels

$1\frac{1}{2}$ c. sugar	$\frac{1}{2}$ c. butter
$\frac{1}{2}$ c. molasses	$\frac{3}{4}$ c. water

$\frac{1}{2}$ to $\frac{3}{4}$ tsp. vanilla

Cook all of the ingredients, except the vanilla, together to a rather soft hard-ball stage (250° F.), remove from the stove and flavor with vanilla, and pour into a buttered pan. When cool, cut in squares, and shape the pieces into cubes by pressing them between two knives. Wrap in oiled paper if desired.

3. Popcorn Balls

1 c. molasses	$\frac{1}{4}$ tsp. baking soda
1 c. sugar (or corn syrup)	$\frac{1}{2}$ tsp. salt

6 qts. popped corn

Cook the molasses and sugar to the crack stage, add the soda and salt, and pour over the corn, stirring the corn. Let it stand a few moments, then wet your hands in cold water and shape the corn into balls by pressing it together between your hands.

4. Glacé-Fruits and Nuts

2 c. sugar	$\frac{1}{8}$ tsp. cream of tartar
1 c. boiling water	Fruit and nuts

In the top of a double boiler, over a direct flame, boil the sugar, water, and cream of tartar together to the point at which the mixture begins to discolor, but do not let it get above 310° F. Take it from the fire at

once. Fill the bottom of the double boiler with boiling water and place the top in it in order to keep the syrup soft while you dip. Drop two or three nuts at a time, or pieces of dates or figs, sections of oranges, or California grapes with short stems, into the syrup, and then take them out one by one with a two-tined fork and place them on oiled paper to harden. Work quickly. If the syrup becomes too thick, add water to it and boil it again to the right temperature. Glacé-fruits soon become soft so that they do not keep more than a day, and should be made only in clear, cold weather.

Carbohydrates

Carbohydrates are sugars, and substances like cellulose, starch, and pectin, which may be changed into sugars either by boiling with acids or by ferment action. The name given to this group signifies that all the substances are composed of carbon (notice how they all grow black as they burn) and hydrogen and oxygen, which are usually present in the same proportion as in water.

The carbohydrates are divided into three groups according to their complexity, and are called mono-, di-, and poly-saccharides. The chief members of the groups are as follows:

Monosaccharides	Disaccharides	Polysaccharides
Glucose Fruit sugar (fructose) Galactose	Cane and Beet sugar (sucrose) Milk sugar (lactose) Malt sugar (maltose)	Cellulose Pectin Glycogen Starch Dextrin

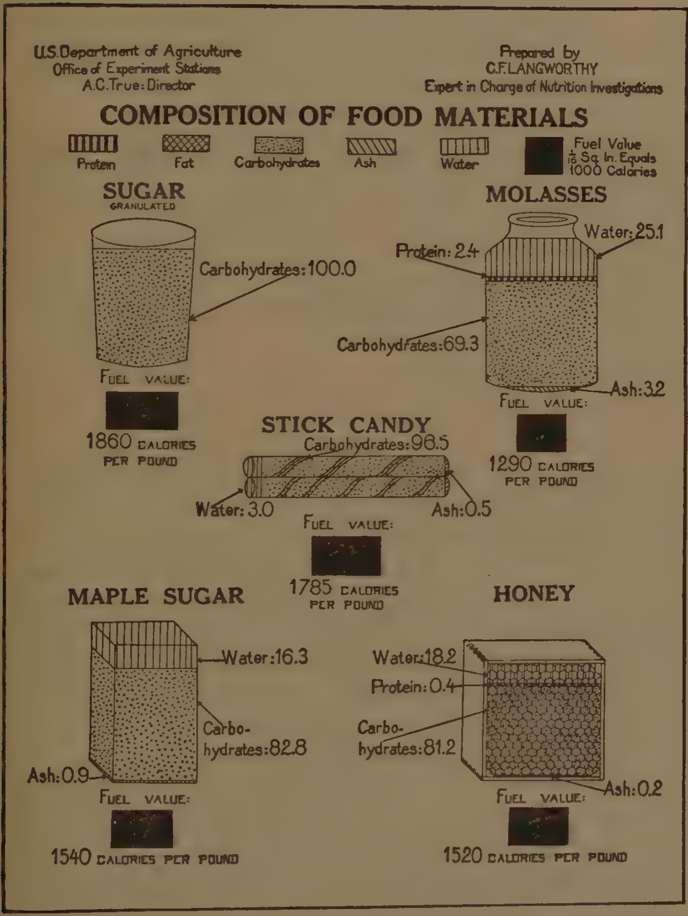
Single and Double Sugars

All the members of the first and second group are sugars, and they are all soluble in water and sweet to the taste, although they differ very much in their sweetness. Fructose is the sweetest of them all, and sucrose the next.

In Section X, you learned that plants manufacture sugar from water and from carbon in carbon dioxide. This sugar is probably single sugar, and is then changed into double sugar or into polysaccharide. Now when we digest food we do just the opposite, for we change the more complex substances into single sugars. However, the plants can carry on this breaking-down process too, for this is what happens when a plant uses stored starch, as, for example, a potato when it sprouts. Boiling polysaccharides or disaccharides with acids will also break them down into single sugars.

These sugars are so closely related that we shall not be surprised to find that many of our foods contain more than one kind of sugar. Honey and many of the fruits and vegetables contain glucose and fructose. The chief points to be remembered about these sugars is that they do not need to undergo any process of digestion before being absorbed, that they do not crystallize so readily as cane sugar, and that they give the sugar test that you used to see if certain vegetables contained sugar. Glucose is used so extensively for food that it is also manufactured from cornstarch by boiling the starch with acid. This is the sugar which is present in "corn syrup." Glucose is also used commercially in the manufacture of candy.

Galactose is a digestive product of milk sugar and is not found as such in food. Of the disaccharides, sucrose and lactose are the more important sugars in our foods. Lactose is found in milk. It is far less sweet than the



Composition of Foods containing Sugar

others and for this reason is rather better than ordinary sugar for babies. Accordingly, modified milk and other baby foods are often prepared with lactose. It is also used as a basis for sugar pills. It is manufactured commercially by separating it from milk.

The fruits and vegetables which contain glucose and fructose usually contain sucrose also. Curiously enough, this sugar will not give the sugar test unless it is boiled with acid. This process changes it into glucose and fructose, and both these give the sugar test.

Maltose, or malt sugar, is so named because it is found in sprouting barley, which was used in the manufacture of malt. When starch is broken down it may produce maltose, but the maltose may later be broken down into glucose.

Why We Use Glucose or Acids in Candy-Making

When sucrose is boiled with an acid in the presence of water it changes into equal parts of glucose and fructose. Glucose is far less sweet than sucrose, but fructose is much sweeter. Consequently the mixture, "invert" sugar as it is called, is not very different in sweetness from the original sucrose, but the latter is probably a little sweeter. Some recipes call for the addition of sugar to acid fruits after boiling, so that this change will not take place as a result of the cooking. The saving is probably so small as not to be appreciable.

On the other hand, this change is deliberately sought after in making candies like fondant and fudge which must be smooth and velvety, not granular, and in candies like butter-scotch which must not "sugar." The single sugars crystallize with much more difficulty than sucrose, and the presence of even small amounts of them makes the candy less likely to "grain" or "sugar." Sometimes,

instead of bringing about the change by boiling with acid, a little glucose syrup is added to produce the same result.

How the Body Uses Carbohydrates

During digestion all the carbohydrates except some cellulose, and possibly pectin, are broken down into single sugars and are then absorbed and carried to the liver. Here, and in the muscles, any sugar in excess of that needed in the blood is stored as glycogen, or animal starch. At need, the process is reversed, and the stored glycogen is again broken down into sugar to keep the supply of it constant in the blood by which it is transported to the tissues where it is needed to be burned for energy.

Carbohydrates are the cheapest source of energy and therefore we find much more of them in low-cost than in expensive diets. Carbohydrate is important, not only because it provides us with energy, but because it helps to keep the fat burning properly.

Since all the starch we eat must be changed into sugar before it is absorbed, the question may fairly be asked why we should not eat glucose instead of starchy food. There are a number of reasons why this would not be good for us. In the first place, we quickly tire of too much sweet food. Then, too, it would be absorbed so quickly that our livers would not be ready to take care of it in such quantities; too much of it would get into our blood, and we should have to get rid of the excess by excreting it through the kidneys. Our bodies would have had all this work to do without getting any benefit, for unless the sugar can be burned in our bodies it cannot furnish us with energy.

Sugar Substitutes

There are some other substances which are sweet, although they are totally unlike carbohydrates in every other way. Of these, saccharin is a good example. It has no food value, but is sometimes used by people who have difficulty in utilizing much carbohydrate (as in diabetes). As, in too large amounts, it interferes with digestion, its use in food sold in interstate commerce has been forbidden by the United States government.

References

"Our Candy Recipes", by Van Arsdale, Monroe, and Barber.
Commercial geographies and atlases.

Questions

1. Compare sugar and starch in appearance, in taste, in their behavior in cold and hot water, and in their tendency to crystallize.
2. Compare the cost of a pound of cornstarch, of flour, of sugar.
3. What other reasons besides the economic one can you give why it would be unwise to omit all starch from our diet and replace it with sugar?
4. What are brown sugar, molasses, powdered sugar, lump sugar?
5. Why can candy with brown sugar, molasses, or glucose, be easily made without the addition of acids?

Home Work

1. Find out whether brown sugar is less expensive than white. How many cups are there in a pound of granulated sugar? In a pound of powdered sugar? Compare the cost of glucose syrup (corn syrup) and granulated sugar.

2. Most people are very fond of home-made candy and are glad to have some given them for Christmas or birthdays. Perhaps you can make some for this purpose. On

the other hand, a sale of candy is a good way to raise money if you need it for some school purpose. Each member of your class could make candy and then you could sell it at recess or to those present at some football or basketball game.

XXVIII

CLASSIFICATION OF VEGETABLES

Creamed Peas, Carrots, and String Beans

A. **Class Experiments.**

The Effect of Moist Heat on Starch.

1. Mix half a teaspoon of starch with a third of a cup of water. Let it stand. Does the starch settle out? Pour the mixture through a filter paper placed in a funnel. Test the water which passes through for starch. Is starch soluble; that is, does it dissolve in cold water?
2. Examine a few grains of cornstarch under a microscope. Of wheat starch (flour). Compare them with the microscopic appearance of potato starch.
3. Mix a teaspoon of starch with two-thirds of a cup of water. Heat to 180° F., using a thermometer to determine the temperature. Pour off a part, and heat the remainder to boiling. Taste each. Cool, and examine under a microscope the starch in both stages of cooking.

B. Creamed Peas and Carrots in Toast Boxes.

Prepare a cup of finely diced young carrots, washing and scraping them before cutting them up. Just cover

them with water, add salt (remember the proportion of one teaspoon of salt to each quart of water for boiling vegetables), and boil until tender. Use the water which remains in making a cup and a half of medium white sauce. Add a cup of canned peas and the carrots to the white sauce, and when hot serve the mixture in toast boxes. These are made by cutting cubes of the desired size, say two and a half inches on a side, out of the crumb of a stale loaf of bread, hollowing them from one side, and browning them in the oven. They may be brushed over with melted butter before they are put into the oven to brown.

Classifications of Vegetables

The term "vegetable", as it is commonly used, includes many foods which botanically would be classed elsewhere. Rice, macaroni, French chestnuts, and even tomatoes and cucumbers are all examples of such foods. At least, it will be admitted that if they are not vegetables they are used as such.

Classified by the Part of the Plant Used

Classifications of vegetables are many. One is made according to the part of the plant from which they come. For example:

Bulbs: garlic, onions.
Fruits: cucumber, egg plant, squash, tomato.
Leaves: Brussels sprouts, cabbage, lettuce, spinach.
Roots: beet, carrot, oyster plant, sweet potato, turnip.
Seeds: beans, corn, lentils, peas, rice.
Stems: asparagus, celery, chives.
Tubers: Jerusalem artichokes, white potato.

Although this is of interest, it is not much help to us from the food standpoint.

Classified as Watery or Starchy

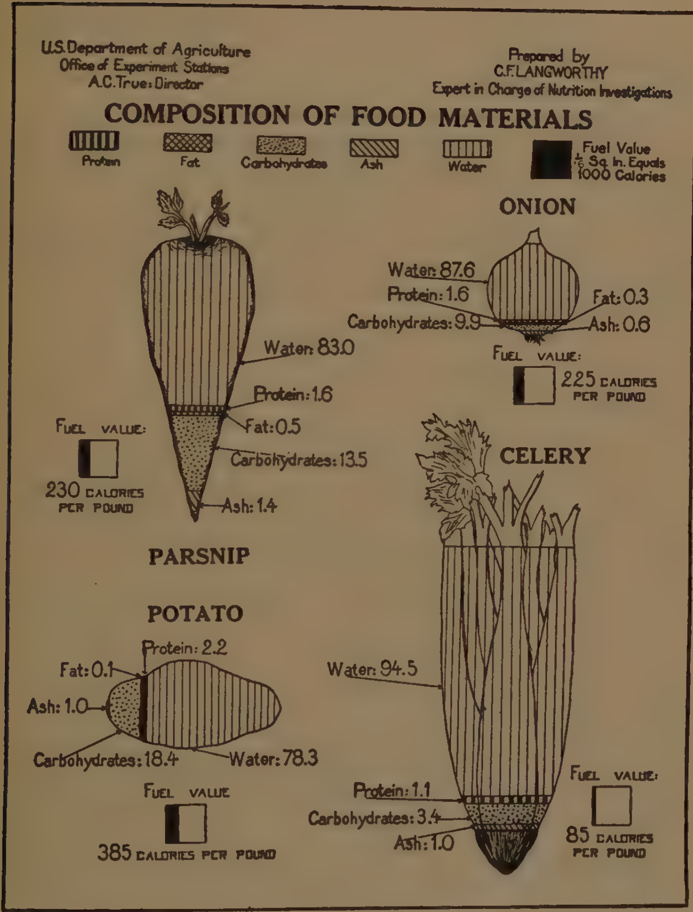
Another classification, made according to food value, gives us succulent, or watery, as opposed to starchy vegetables. This is sometimes misleading, if one concludes from it that watery vegetables have little or no food value. Not only do they contain valuable mineral salts, but, as Sherman, in his book on Food Products, justly says, "Even those fruits and green vegetables that are eaten for flavor with little thought of food value, and which are often thought of as luxuries because of their high water content, will often be found to furnish energy at no greater cost than many of the familiar cuts of meat, when account is taken of the extent to which the fat of the meat is usually rejected or lost in cooking or at the table." This classification, however, is suggestive, especially in menu-making. It is much better to serve a variety of vegetables together, rather than too many from one class. Rice, potatoes, and macaroni are much better substitutes for one another than served at the same time.

Classified by Season

An old classification as to season shows, at least, how times have changed, for with greater facilities for transportation from both North and South, together with hot-house vegetables, the display in a market no longer follows the old list. Celery, for example, was given as a fall and winter vegetable, whereas it is now to be found most of the year.

Classified by Taste

The classification which helps most in cooking is undoubtedly that into mild- and strong-flavored vegetables. With the first group, every effort should be made to retain as much of the flavor as possible. Such vegetables as



COMPOSITION OF VEGETABLES

young peas, tender string beans, and tender greens should be cooked in as little water as possible, because it is only by retaining the soluble contents of these mild-flavored vegetables that we keep their delicate flavor and their full nutritive value.

On the other hand, if we are cooking very strong-flavored vegetables, such as some mature onions and cabbages, the flavor may be improved if some of the strong taste is removed, and then we may be justified in sacrificing some of the nutritive value. However, most of the cabbages and onions now sold in the stores are likely to be rather mild in flavor.

References

U. S. Dept. of Agriculture. Farmer's Bulletin No. 256. "Preparation of Vegetables for the Table."

Questions

1. Make lists of strong, and of sweet or mild-flavored vegetables.
2. Are vegetables which contain little starch cheap or dear food compared with the amount of nutrients they contain?
3. How is their use justified?
4. Suggest uses for the water in which vegetables have been cooked.

Home Work

1. Make and keep for reference a list of common vegetables, giving season, amount needed for a family of four, and the probable cost of that amount when in season. (The work on this table may well be divided between the different members of the class.)

2. If you use canned string beans at home, try creaming some of them.

Creamed String Beans.

2 c. string beans
$\frac{3}{4}$ c. medium white sauce

XXIX

VEGETABLES

Cream Soups
Celery and Potato Soups
One Use of Left-over Vegetables

A. Make Croutons.

Cut stale bread into slices, spread thinly with butter, then cut into small cubes. Brown the cubes in the oven, stirring occasionally. Serve with the soup.

B. General Recipe for Cream Soups.

1 to 2 c. vegetables	1 to 2 tbsp. butter or other fat
1 quart liquid, at least half milk	1 tsp. salt
	Paprika, or a little pepper
2 to 4 tbsp. flour	1 to $1\frac{1}{2}$ tsp. salt

(*a*) For a non-starchy vegetable like celery, use four tablespoons of flour.

(*b*) For a starchy vegetable like potato, use only two tablespoons of flour.

(*c*) Use more or less vegetable according to whether it is strong or mild in flavor.

1. Prepare Cream of Celery Soup.

Wash and scrape the celery, and cut it into half-inch pieces. (Often only outside stalks and leaves are used,

while the white, crisp pieces are kept to serve uncooked.) Cook the celery in boiling salted water, adding a piece of onion if desired. When soft, rub through a sieve.

Make a white sauce with the butter, flour, and the water in which the vegetable was cooked, adding enough milk to make a quart of liquid, and then adding the mashed vegetable.

Or, mix the flour with enough cold milk so that it will pour readily (do not leave any lumps of flour) and stir all the ingredients together until the soup boils and thickens.

Which method saves time if you are making a large quantity of soup? Which saves utensils? When would you use a double boiler?

2. Prepare Cream of Potato Soup.

Use one to one and a third cups of freshly mashed potato, one or two slices of onion, and only two teaspoons of flour.

Why is less flour needed here in proportion to the liquid than in celery soup?

To make the soup richer, part cream may be used, or white stock instead of water; or a spoon of well-beaten egg white or of whipped cream may be placed in the serving dish before the soup is poured into it.

Vegetables

Suggestions in Buying Vegetables

In buying vegetables it is wisest to buy those which are in season, rather than imported or hothouse vegetables. The latter are seldom equal in flavor or texture and are usually much more costly. It is easy to blunt our relish for a vegetable by eating poor specimens out of season.

Even when vegetables are in season, there is much choice to be exercised in their selection. Some vegetables, when

kept, do not retain their sweet flavor. This is especially true of green peas and corn, in only less measure of string beans and asparagus. Such vegetables must be fresh, and freshness is told chiefly by crispness. Asparagus can be judged partly by seeing whether the stems have been cut recently. In corn, not only should the silk be brown, but the ear filled with well-developed kernels. The kernel, when cut, should be tender and juicy. String beans should have a brittle pod with tender strings, and the beans should be small. Some varieties of peas are large; unless of such a variety, young peas are small. Pods should be crisp and green and, for the sake of economy, full.

Fresh spinach, celery, lettuce, cucumber, radishes, summer squash, and tomatoes are not difficult to select. Lettuce and celery should be tender as well as fresh and crisp. The freshness of young carrots and beets can be told by their leaves. With older ones, in the winter market, smaller vegetables are not only more tender, but, if bought by measure, give more for the money.

How to Freshen Wilted Vegetables

If wilted vegetables must be used, they should be soaked in cool water to freshen them as much as possible. The effect is much the same as with wilted flowers. Vegetables do not, however, keep well standing in water. The water becomes full of bacteria, just as does the water in which flowers stand, and, if the vegetables are cut, some of the soluble constituents are soaked out. Celery, lettuce, cucumbers, radishes, and so forth, should be kept wrapped wet in paper, or put in tightly covered jars in a cool place. Dried vegetables, of course, must be soaked, but only for a limited time, to restore the water which has been lost in drying.

Summer Vegetables

Summer vegetables should be cooked as soon as possible after they are picked. Especially corn, peas, and other vegetables which lose their sweetness on standing, are better if they are cooked immediately, even if they have to be reheated in a double boiler when they are served, than if they are cooked after long standing.

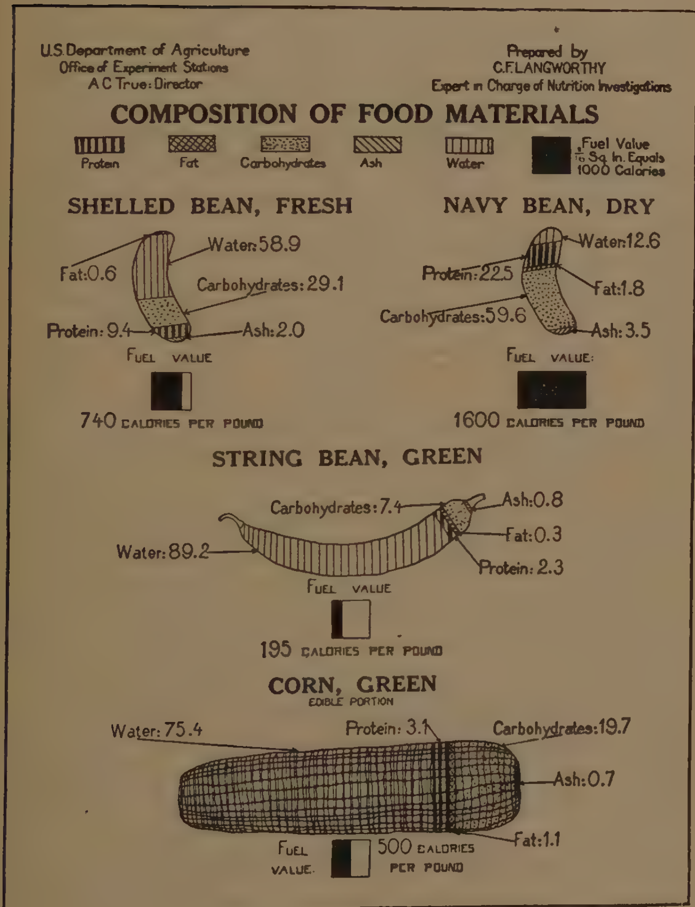
Winter Vegetables

Winter vegetables to be stored should be kept cool, dark, dry, and piled up, to keep out as much air as possible. Squashes are an exception and should be spread out in a warm, dry place. Some winter vegetables can be stored in a cool cellar buried in sand.

Composition Affected by Cooking

Although vegetables differ greatly in regard to their composition, they are all valuable for their mineral salts. But unless care is taken, these valuable constituents, as well as much soluble protein and sugar, will be lost in the preparation. If vegetables are boiled in large quantities of water, it is difficult to use every bit of the water. Recent experiments[1] have shown, for example, that while spinach and cabbage lose very little when steamed, over thirty per cent more of the total solids are dissolved by the water when the same vegetables are boiled. For this reason steaming is better than boiling, but even then a steamer should be used which does not allow the condensed steam to drip back from the vegetables into the water in the bottom of the steamer. Steamers in which the holes are pierced only near the top of the inside vessel will accom-

[1] *Journal of Home Economics*, December, 1912, "Losses in Cooking Vegetables."



COMPOSITION OF LEGUMES AND CORN

plish this result. Of course, even so, all the liquid that does collect around the vegetables must be utilized. Steaming usually takes somewhat longer than boiling, but there is not a great deal of difference in the time.

Cooking in the waterless cookers which have recently been put on the market, in casseroles, and by "panning" are all to be preferred either to boiling or steaming when both flavor and composition are taken into account. "Panning" is a method devised recently by the United States Office of Home Economics. It consists of cooking the vegetable in a pan on top of the stove with so little water added that at the end practically all of it is evaporated or absorbed. A heavy pan that distributes the heat is better for this purpose than a thin pan, for there is less danger of burning. Baking, of course, is another good method of cooking vegetables.

There is another set of ingredients that must be considered in our cooking of vegetables, — the vitamins. Unfortunately we know almost nothing yet in regard to the effect of different methods of cooking on them, but we do know in general that the longer we cook the vegetables the more some of the vitamins are affected. Therefore we should cut our vegetables up into small pieces, or else grate them, before we cook them. As this would mean a still greater loss of the soluble constituents if the vegetables were to be boiled in large amounts of water, it is very clear that other ways of preparing them should be used whenever possible. Then, too, we should cook our vegetables just as short a time as we can. As a general rule vegetables are greatly over-cooked, losing much flavor in this way. Such vegetables as spinach and cabbage and asparagus become slimy and quite different in texture and flavor as a result of cooking too long. Unless we are using a great deal of raw vegetables and fruits in our diets, the length of time used

in cooking makes a vast amount of difference in the amount of vitamins that we shall obtain in our cooked food. Vitamin C is one of the vitamins that is rather readily distroyed by heating, yet tomatoes which are especially rich in this vitamin retain a great deal of it, even when they are canned. They seem to be an exception to our rule. That is why canned tomato juice is sometimes used in place of orange juice for babies that are being fed only on heated milk.

References

U. S. Dept. of Agriculture.

Office of Exp. Sta. Bulletin No. 123. "Course in the Use and Preparation of Vegetable Foods."

Farmers' Bulletin No. 879. "Home Storage of Vegetables."

Questions

1. Make a list of as many of the common vegetables as you can that would contain sufficient starch to have a thickening effect in making soup.

2. Make a list of succulent vegetables which you think would make good soup. How would a recipe for making cream soup from these differ from one for making soup with starchy vegetables?

Home Work

1. Using a cook book, make a list of seasonings which are desirable to use in soups.

2. Make as many different kinds of cream soup as you can. Since these are rather too hearty to eat at the beginning of a substantial dinner, your family may prefer to have them served at lunch or supper. Such soups may be made from left-over vegetables.

Cream Soups from Left-over Vegetables.

Usually a creamed vegetable needs only to be heated with additional milk and rubbed through a sieve, then seasoned. If there is not enough of a single vegetable, combinations of vegetables can often be used.

XXX

MEASURING BY CALORIES

Strong-flavored Vegetables
Cabbage or Onion

A. Cooking Strong-flavored Vegetables.

Boil cabbage or onion

1. In very little water (*a*) covered
   (*b*) uncovered
2. In much water (*a*) covered
   (*b*) uncovered

Compare the odor given off while cooking, and the flavor of the vegetable at the end. Which is the best method of cooking strong-flavored vegetables? Save the water used, as well as the vegetable.

B. Prepare Scalloped Cabbage or Onion.

Place the vegetable cooked in (*A*) in a buttered baking-dish, mix with medium white sauce, and sprinkle with buttered crumbs.

C. Prepare Cream Soup.

Use the water in which the vegetables were cooked. Make your own recipe.

Measuring by Calories

In Lesson VI we have already summed up the nutrients of food into the six groups, called foodstuffs: proteins, carbohydrates, fats, water, mineral substances, and vitamins; and have spoken briefly of their functions in the body. But nothing has been said about the amount of each of these which should be supplied in our food.

One Way of Measuring Food

How much should each individual eat? What measure can we find in which to state a definite reply to this question? It is quite evident that a pound of lettuce and a pound of meat would really count quite differently so far as nourishment is concerned, and at first the problem seems as complicated as trying to add French francs, English shillings, and American dollars together without being able to change them into a common medium. But if we consider the part played in the body by these food nutrients, we shall find one point of view from which they can be compared.

One of the functions of food is to supply us with fuel material which, when it is burned, supplies our bodies with energy or power. Without this energy we could not live, for without it we could not breathe or carry on any of the bodily processes which mean life itself. It is, then, a matter of the utmost importance that our bodies be supplied with enough energy for all these processes, and since food is the sole source from which our bodies can obtain energy for this purpose, we can consider different foods from the standpoint of the amount of energy that they supply.

Physics gives us many ways of measuring energy, but the method that proves most applicable to food is to

measure it as heat by burning the food and measuring the amount of heat given off. In all measuring we must use a unit of measurement, and just as in measuring weight we use pounds, and in measuring length we use feet, so in measuring heat we use calories.

The large calorie, which is the unit of heat by which the fuel value of food is measured, is the amount of heat necessary to raise the temperature of a kilogram of water one degree Centigrade, or — to express it in terms which will mean a little more to us — about the amount of heat that would raise the temperature of a pound (about a pint) of water four degrees Fahrenheit.

The Calorimeter

To determine the energy value of a foodstuff all that is necessary is to burn a given amount of it in such a way that all the heat given off shall be taken up by water. Then, knowing the amount of water and the rise in temperature, the number of calories of heat given off can be calculated. Such an apparatus is called a calorimeter, from the Latin words *meter*, or measure, and *calor*, meaning heat. A hollow metal cylinder, containing the material to be burned and a supply of oxygen, is immersed in an insulated tank containing a measured amount of water. Combustion is started by sending an electric spark through the foodstuff. The heat given off passes through the metal cylinder into the water. The rise in temperature is very accurately determined by means of thermometers, and corrections are made for any unavoidable escape of heat.

Foodstuffs as Energy-givers

We know that, although they are of such importance in our food, neither water nor mineral matter is burned in the body, so they are not sources of energy; and vitamins,

of equal importance, are nevertheless present in too small amounts to affect fuel value. So the three foodstuffs which supply the body with energy are proteins, carbohydrates, and fats.

All the carbohydrates and fats which are digested and burned in the body give off, so far as is known, the same amount of energy under these circumstances that they do in the calorimeter. Proteins, however, are not completely oxidized in the body, and so furnish it with a somewhat smaller amount of heat than the calorimeter would indicate. Allowing for losses in digestion, it has been determined that every ounce of either protein or carbohydrate eaten supplies the body with 113 calories of heat; fats have greater fuel value and give 255 calories for every ounce.

Two Methods of Stating Food Composition

In stating the composition of food, sometimes the percentages of the various ingredients are given. Another way of expressing it is to state the number of calories of heat given by the carbohydrates, fats, and proteins in an amount of food which furnishes a total of one hundred calories of energy. This amount is known as the "standard portion" or "hundred-calorie portion." Of the two methods, the second is perhaps less confusing, especially when comparisons between foods are to be made.

For example, suppose a boiled potato and white flour are to be compared. The percentage composition of the two is as follows:

	Water	Protein	Fat	Carbohydrate
Boiled potato	75.5%	2.5%	.1%	20.9%
Wheat flour	12.8%	10.8%	1.1%	74.8%

With this great difference in the percentage of water present, it is evident that the percentages of the other ingredients cannot be compared directly.

Now look at this statement of the number of calories furnished by the ingredients in the hundred-calorie portions of the two:

	Weight of 100-Calorie Portion	Calories from		
		Protein	Fat	Carbohydrate
Boiled potato . .	$3\frac{2}{3}$ oz.	11	1	88
Wheat flour . .	1 oz.	12	3	85

It is at once evident that they are not so unlike in their nutritive elements, but that about four times as much weight of potato must be eaten to provide us with the same amount of energy.

If potatoes cost three cents for a pound and flour is six cents a pound, it is easy to calculate that four pounds of potatoes would cost twelve cents, while a pound of white flour would furnish the same amount of fuel value for six cents.

Again, compare milk with flour.

	Water	Protein	Fat	Carbohydrate
Flour	12.8%	10.8%	1.1%	74.8%
Milk	87.0%	3.3%	4.0%	5.0%

The difference in the percentage of water present in the two makes it hard to decide which really furnishes the more protein, or fat, or carbohydrate, but see how the differences stand out in this calorie statement.

	Weight of 100-Calorie Portion	Calories from		
		Protein	Fat	Carbohydrate
Flour	1 oz.	12	3	85
Milk	5^{+} oz.	19	52	29

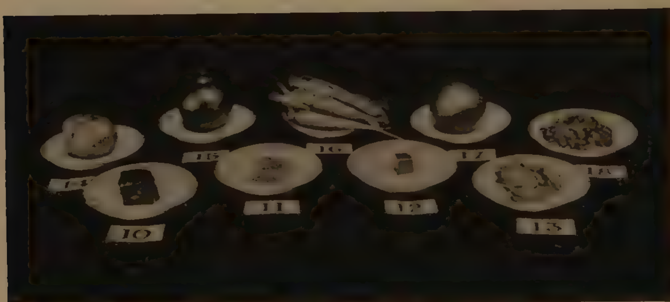
It may be seen by the second table that over five times as much milk is necessary to equal the total calories in flour, but that the milk will furnish almost twice as many calories from protein. If milk costs six cents a pint (about a pound), it is evidently much more expensive both as a source of energy and as a source of protein. In both these cases, however, we must remember that we are ignoring the value of the foods as sources of vitamins and mineral matter. Spinach, for example, which would be costly as a fuel food, is invaluable as a source of supply of iron and Vitamins A and B.

Such comparisons are of great interest, for food value and cost, curiously, have no connection with each other. Some of the government pamphlets show by graphs the amount of fuel value which can be purchased in different foods for a given amount of money, but the price of foods changes so rapidly that these quickly become antiquated.

Since many of our servings of food are about a hundred-calorie portion, or bear a simple relation to it, it is convenient to use such a table in estimating the fuel value of a meal. A table of this kind will be found in the Appendix.

Number of Calories Needed Daily

Our next problem is to determine the number of calories that a person needs each day. This is obviously affected by the size of the person whose temperature must be maintained, as well as by the amount of energy used up in



ONE-HUNDRED-CALORIE PORTIONS

(See illustrations)

1. Cornstarch Pudding 1½ oz.
2. Walnuts ½ oz.
3. Chocolate ½ oz.
4. Ice Cream
5. Cereal 1 cup cooked
6. Sponge Cake 1 oz.
7. Crackers ¾ oz.
8. Milk 5 oz.
9. Bread 1½ oz.
10. Steak 1¼ oz.
11. Butter 1½ oz.
12. Cheese ¼ oz.
13. Salmon 1¾ oz.
14. Potato 3⅔ oz.
15. Apples 7½ oz.
16. Carrots 7¾ oz.
17. Orange 9½ oz. A. P.
18. Baked Beans 2¾ oz.

work. Atwater, for the United States Department of Agriculture, determined the following amounts as necessary for the average man or woman of average size. The woman is allowed less because she usually weighs less.

Daily Calorie Needs

Man with hard muscular work	4150 calories
Man with moderately active work	3400 calories
Man at sedentary work, or woman with moderately active work	2700 calories
Man without muscular exercise or woman at light to moderate work	2450 calories

For further details, consult the tables in the Appendix.

Questions

1. Define the calorie used in estimating the fuel value of foods.
2. Explain how the fuel value of food may be estimated.
3. What important constituents of food are not measured by calories?
4. Which foodstuffs furnish the body with fuel?
5. Would you expect a food with much water to be high in calorie value?
6. Using the serving-calorie table in the Appendix, estimate the number of calories in a breakfast consisting of the following:

Menu

½ orange	1 glass of milk
1 shredded wheat biscuit	1 slice of toast
½ cup cream	1 slice bacon (1 oz.)

1 pat butter

Home Work

1. Make a list of vegetables that you think would be good creamed. Strong-flavored vegetables when creamed will often be eaten by people who do not care for them

plain because in this way the flavor is less pronounced. Suggest some of these. Make another list of vegetables that you think would have sufficient flavor, so that the water in which they are cooked would give sufficient flavor to make good cream soups. Now check your lists up, using a good cook book, and see if you can get any more suggestions for practical use. Try making some of these dishes.

2. Keep account of what you eat at some meal and reckon the number of calories you have had.

XXXI

AMOUNTS OF FOODSTUFFS NEEDED

Green Vegetables

Spinach, Boiled or Creamed
Lettuce
Salad Dressings

A. **Class Experiments.**

The Freshening of Green Vegetables.

1. Soak lettuce in ice water for half an hour.
2. Soak lettuce in ice water over night.
3. Wash lettuce and put it in an air-tight can or jar on ice in an ice-box; allow it to remain an hour or longer.
4. Wash lettuce, wrap in a damp cloth, and place on ice in an ice-box; allow it to remain an hour or longer.
5. Wash lettuce, wrap it in a damp cloth, and hang in the wind.
6. Pour a little French dressing (see below) over a lettuce leaf, and let it stand awhile.

How would you recommend keeping lettuce? How freshen it quickly? When should it be dressed?

B. Cooking Greens.

Pick over and wash very carefully in several waters spinach or other greens.

1. Cook for ten minutes in a saucepan without the addition of more water than remains from the washing, tossing frequently to prevent burning. Chop. Continue simmering until tender.
2. Cook uncovered in a large amount of salted water until tender.

Compare the flavor and color obtained by the different methods of cooking. Notice the amount of spinach which you have before and after cooking.

Season part of the spinach with salt, pepper, and butter, and serve with slices of hard-cooked eggs.

Pack the rest into a mold to cool. Serve as salad with one of the following dressings.

French Dressing.

Use one-third to one-half as much vinegar or lemon juice as oil, and a quarter of a teaspoon of salt for each tablespoon of oil. Add a little pepper or paprika. Beat with a spoon till well blended.

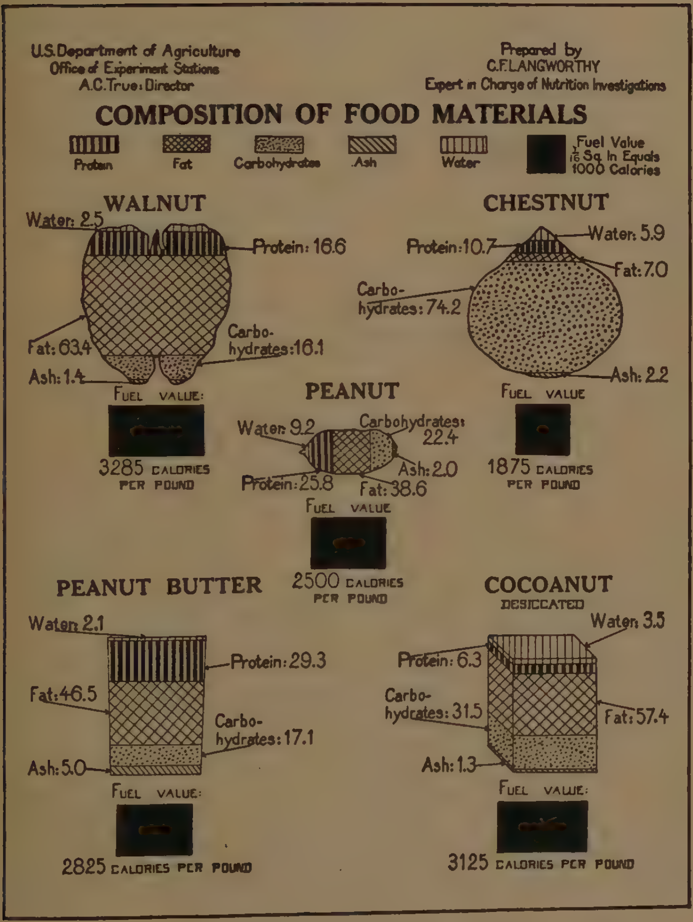
Boiled Salad Dressing

½ tsp. mustard	1 c. milk
1 tsp. salt	2 tbsp. butter
1 tbsp. flour	1 egg
¼ tsp. paprika	¼ tbsp. vinegar

Mix the dry ingredients and add the milk and butter. Heat the mixture to boiling, stirring constantly. The top of a double boiler may be used. Cool somewhat and pour the mixture over the egg, beaten slightly; then heat over water until it is very thick. When the dressing is cool, stir in the vinegar. A tablespoon of sugar may be added.

The Amounts of Foodstuffs Needed

From what has already been said it is evident that getting the correct number of calories by no means solves



COMPOSITION OF NUTS

the problem of what we should eat. If we ate sugar alone we could easily have enough calories without any foodstuff except carbohydrate; or we might get all our calories from oil and then have nothing but fat. In either case, we should have no protein, no mineral matter, no vitamins, and only one of the fuel foods, and we should not be able to live on such a diet. Let us see what is known in regard to the amount of each of these different foodstuffs that our bodies need.

Carbohydrates and Fats Play Much the Same Part in Our Bodies

Both carbohydrates and fats (oils are merely liquid fat) are composed of the elements carbon, hydrogen, and oxygen — although these are not present in the same proportion in the two substances. So much alike are they, however, that these two foodstuffs seem to play somewhat the same part in our nutrition; that is, both act mainly as fuel foods, and we seem to be able to a certain extent to replace one with the other in our diets.

But in spite of their similarity, we seem to need some of both in our diet. If you read about the Germans in the Great War, you know how difficult they found it to get on comfortably with only very, very small amounts of fat. They complained that, however much they ate, they seemed to grow hungry again at once. On the other hand, the Eskimos eat a diet containing a minimum of carbohydrate and a great deal of fat, but it certainly would be exceedingly hard for us to eat no sugar, starch, or cellulose. So it appears that we can reduce the amount of one and eat more of the other without discomfort, provided we have some of both.

Proteins Are Used for Body-Building as Well as for Fuel

Proteins play a double part in our bodies. Their name means "first" or "chief", and was given because they are the only foodstuffs which contain nitrogen and so are essential for the building and repairing of body tissue, since this also contains nitrogen. Besides nitrogen, proteins contain carbon, hydrogen, and oxygen, as well as other elements, such as sulphur and phosphorus, in smaller quantities. It is only from proteins that the body can get nitrogen for this constant building and repairing, but the body does not necessarily use them only for building, for it may also burn proteins for energy.

At first it may not seem clear — since we may use proteins for both building and fuel — why we should not live on proteins alone and omit the other fuel foods, but the difficulties would be many. In the first place, it would certainly be an expensive diet, for not only are most protein foods more expensive than the other fuel foods, but we should need very large amounts of them to get the necessary number of calories. If you ate lean beef, for example, you would need to eat about a pound and a third at each of the three meals each day. Meanwhile you would be eating about eight times as much nitrogen as the body could use, and when protein is used for fuel, the body has to get rid of the useless nitrogen through the kidneys, since there is no way in which it can be stored in the body for future use. There would certainly be no advantage, and possibly great harm, in demanding so much unnecessary work of our bodies.

The Amount of Protein Needed

Both fat and carbohydrate can be stored in the body for future use, but there is no way in which we can store extra

protein or nitrogen. Therefore we are dependent upon continually getting enough to supply our immediate needs. How much then do we need every day? That depends upon a number of things. Of course, during the periods of growth we need relatively more than in adult life. The average man apparently is amply supplied if about 300 of the calories he takes each day come from proteins, or, to state it more exactly, if an adult has two calories for each pound of body weight. In "Feeding the Family", Mrs. Rose suggests that the following amounts of protein should be provided in our diets:

Amount of Protein Needed Daily per Pound of Body Weight

For adults,	2 Calories
For young people from 12 to 17	3 "
For children from 3 to 12	3 to 4 "
For children from 1 to 2	4 "

Needs of the Body for Mineral Matter

The necessity for seeing that the body is supplied with sufficient mineral matter has already been discussed in Section XI. For an adult, the amounts of those chemical elements most likely to be insufficient in our diets are believed to be the following:

Amount of Certain Mineral Elements Needed Daily per Man

Calcium	0.67 grams or 0.023 grams per hundred calories
Iron	0.015 " " 0.044 " " " "
Phosphorus	1.32 " " 0.0005 " " " "
Iodine	Trace (exact amount not determined; see Section XI)

How much of this mineral matter is needed by children is still unsettled. At present we believe children up to twelve or fourteen should have a gram a day of calcium. But it is probable that until they are eight, two-thirds of

the amount of iron and phosphorus considered desirable for a man will be enough for their needs. After that age, we think they need at least as much as the adult standard, and very probably the adult girl needs even more iron.

Needs of the Body for Vitamins

Since we know so little about vitamins — see pages 487–493 for the little we do know as yet about their effects and occurrence — we can, of course, make no definite statement in regard to the exact amount of each which is needed. In the next section, when we discuss the foods necessary to supply the body with all the necessary substances, it will be possible to make more definite statements in regard to exact amounts of certain kinds of food that we must have to supply us with these vitamins.

Points to Remember

1. The right number of calories does not insure the right amount of the different foodstuffs in a diet.

2. We need some fat and some carbohydrate in our diet, but those two may more or less replace each other, since both are fuel foods.

3. There is a minimum amount of protein which we must have for body-building and repair. Nothing can replace this amount in the diet, nor can it be stored for future use. It must be constantly supplied. Reasonable excess of protein food is probably not harmful.

4. Enough of the mineral substances is as essential for keeping the body in proper condition as is enough protein.

5. A liberal supply of at least four vitamins is essential, not only to proper growth in childhood, but also to body maintenance and health in adult life. However, young people show the bad effects of a diet low in vitamins

more quickly than do adults, and it is entirely possible that they need a diet that is richer in vitamins than one that is adequate for adults.

Reference

"Feeding the Family", by Mary S. Rose.

Questions

1. Are vegetables that contain little starch cheap or dear food when considered from the viewpoint of fuel value?
2. Why are they of such value in our diet?
3. Suggest uses for the water in which vegetables have been cooked. Why is it worth while to use this water whenever possible?
4. From your own weight calculate how many calories from protein you should have every day.
5. If you drank a pint of milk a day, ate a shredded wheat biscuit, a quarter of a pound of round steak, one serving of potato, and three slices of bread (weighing $1\frac{1}{2}$ oz. each) in a day, calculate roughly (using the Table of Fuel Values in the Appendix) the amount of calories from protein that would be supplied you. Would this be enough for your protein requirement? Would you conclude that you are likely to have too little protein in your diet?

Home Work

1. List leaves which may be substituted for spinach as "greens." Can the outer leaves of lettuce, not desirable for salad, be used in this way?
2. Cook some kind of greens for home use. Many people do not like them because they are so often cooked until they are almost slimy. Do not cook them any longer than necessary, on account of texture and vitamin content. No one likes greens that are gritty. The best way to remove the grit is to wash the greens repeatedly in a large amount of water, lifting the greens out each time after they have been vigorously soused in the water. Pouring the water off lets much of the grit still cling to the leaves.

Many people who do not care for greens plain will relish them if they are served hot with French dressing. Others like them creamed in the following way:

Creamed Spinach.

3 tbsp. butter
2 or 3 lbs. spinach, boiled
2 tbsp. flour
$\frac{3}{4}$ c. milk

Melt the butter in a frying pan, add the spinach, and cook for a minute or two, then sift the flour over the spinach, stir it thoroughly, and add the milk gradually. Cook it for five minutes.

XXXII

CHOOSING OUR FOOD

Salads

Salad Dressings (*continued*)

A. **Class Experiments.** Emulsions.

1. Shake together a few drops of oil with a little vinegar or water. Examine. Let stand, and examine again. Is the emulsion permanent?
2. (*a*) Shake together a few drops of oil with a little sodium hydroxide solution or a strong solution of soap in water, and examine after letting it stand.

   (*b*) Shake together a little oil with a little vinegar and a little egg yolk, and examine after letting it stand.

B. Make a Mayonnaise Dressing.

Use the following proportions:

½ tbsp. mustard[1]	¼ tsp. paprika
½ tbsp. sugar[1]	2 tbsp. vinegar
½ tsp. salt	1 tbsp. lemon
1 egg yolk	1 c. oil[2]

[1] May be omitted.

[2] Olive oil or a good vegetable oil may be used. A mixture of equal parts of the two is sometimes used.

Have the mixing bowl and the ingredients cold. In very warm weather the bowl may be surrounded with cracked ice. Mix the yolk with the dry ingredients and vinegar, then add the oil a drop or two at a time until two or three teaspoonfuls have been added, beating vigorously between each addition of oil. After this, the oil may be added more rapidly, about a tablespoonful at a time. Use the lemon to thin the mixture when it becomes too stiff to beat easily. When done, it should be stiff enough to hold its shape.

If the oil separates out, beat another yolk, and add the separated mixture slowly, beating vigorously.

The mayonnaise may be mixed with whipped cream, or with stiffly beaten white of egg, immediately before serving.

Mayonnaise keeps well, but it should be kept closely covered in a cool place, and should not be stirred when used.

C. Salads.

Serve dressing on salads, using such combinations of meat, vegetables, fruits, and nuts, as seem desirable.

Review Lesson XXIX for treatment of lettuce.

Suggestions:

1. Apple and date
2. Orange, pineapple, and grape
3. Apple, celery, and nut
4. Cabbage, chopped into small pieces
5. String beans
6. Banana, cut in halves lengthwise and sprinkled with chopped nuts
7. Potato salad
8. Cold molded dandelion greens
9. Beets, cut in small pieces, with sour-cream dressing

Sour-Cream Dressing.

Beat powdered sugar into thick, sour cream, and season with salt, pepper, and lemon juice or vinegar to taste. Allow about a half-teaspoon of sugar to each tablespoon of sour cream.

Choosing Our Food

It is obviously impractical for ordinary people to try to calculate the exact amount of foodstuffs which they eat daily. This is sometimes necessary in cases of illness in hospitals, but it would be an impossible task for any housekeeper. How then is the housekeeper to plan food so that there shall be enough of each needed element?

Five Food Groups

The United States Department of Agriculture has suggested a most useful classification of foods. It divides them into the following groups:

Five Food Groups

Group I. Vegetables and Fruits
Group II. Efficient Protein Foods: Milk, eggs, fish, meat, cheese, soy beans, and peanuts
Group III. Cereals and Cereal Preparations: Wheat, oats, corn, etc., breakfast foods, flour, macaroni, etc., bread, cake, pies, etc.
Group IV. Sugar and Sugary Foods: Sugar, honey, syrups, preserves, etc., candy
Group V. Fats and Fat Food: Butter, oleo, lard, oil, bacon, salt pork, pork sausage, chocolate, cream, common nuts, except chestnuts

Some authorities think milk such an important food that they would make one group of sugars and fats, and put milk in a group all by itself, separate from the other proteins.

Points to Remember about Each Group

Let us sum up from the standpoint of these Five Food Groups some of the things we have already said about the different foodstuffs needed for proper nutrition.

Group I

1. Vegetables and fruits are our chief source of necessary mineral substances. They are useful because they are bulky foods in proportion to their calorie value. This enables us to eat enough of them so that we can obtain sufficient of the mineral substances without at the same time overloading our bodies with protein and fuel.
2. Vegetables and fruits are also valuable sources of vitamins. Green leaf vegetables are particularly valuable food because of their mineral and vitamin content. They are especially high in iron and Vitamin A, while oranges, lemons, and tomatoes are rich in Vitamin C. Practically all vegetables contain more or less Vitamin B.
3. Some fresh, raw fruits and vegetables should be used because the vitamin content is usually lowered by cooking, Vitamin C being especially likely to be destroyed by the heating, drying, or ageing of food.

Group II

1. The protein foods of this group are used to special advantage in the body for growth and repair.
2. Some of these foods are valuable sources of mineral substances. Meat and egg yolk are rich in iron, milk in calcium, and peanuts in phosphorus.
3. It is hard to supply a balanced diet without a liberal use of milk and eggs. Children should have a quart

of milk a day, adults a pint. Of course, some of this milk may be the milk used in the preparation of their food. Ordinarily, milk cannot be satisfactorily replaced in the diet of a growing child.

4. Some protein foods are a valuable source of Vitamins A and B. Fresh raw milk probably provides all three vitamins, but, although the amount of Vitamin C varies with circumstances, it is always less abundant in milk than in the fruits mentioned above.

Group III

1. Cereals are the staple of the world's diet because they are available almost everywhere, are easy to transport and store, and relatively cheap.
2. In our average American diet, cereals supply a little more than a third of our protein, but the kind of protein present needs to be supplemented with meat, poultry, eggs, milk, or cheese.
3. Cereal products from the whole grain supply some mineral substances and vitamins.

Group IV

1. Sugars and sweet foods are valuable for fuel, and for flavor.
2. Too much of these foods is likely to cause us to eat too little of the foods which supply us with mineral substances, vitamins, and proteins.

Group V

1. Fats and fat foods are our most concentrated foods, having a higher fuel value than any of the others.
2. They add flavor and richness to the diet, but may easily be used in excess. American diets tend toward an excessive use of fat.

3. Cream and butter fat are valuable sources of Vitamin A and so are more important than are the other fats in the diet of growing children unless they have an abundance of whole milk.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1383. "Food Values and Body Needs."

"Feeding the Family", by M. S. Rose.

Questions

1. Into what two general classes would you divide salads?
2. Which kind of salads would it be appropriate to include in a hearty-dinner menu?
3. What are the chief points to consider in judging a salad?
4. What ways do you recommend for caring for celery which must be kept for a day or two?
5. Why is it worth while to learn to like salads?
6. What are the Five Food Groups? How do they differ from the foodstuffs?
7. Discuss the special value of each of these food groups.

Home Work

1. Keep a list of all the different kinds of salads which your family will let you plan and prepare. Look in cook-books for suggestions for different combinations. Left-over vegetables may almost always be used in salads, and may often be combined to advantage; so no portion of a vegetable, no matter how small, should be thrown away because it is left over and is not enough to serve by itself at another meal. Finding combinations of food for salads and trying to make them attractive to the eye is a truly fascinating task.

2. A quick and inexpensive salad dressing may be made as follows:

Boiled Mayonnaise Dressing.

$2\frac{1}{2}$ tbsp. flour	1 egg yolk, beaten
2 tbsp. oil	2 tbsp. vinegar
1 tsp. salt	1 c. oil
$\frac{1}{3}$ tsp. paprika	
1 c. hot water	

Mix the ingredients given in the first column and, stirring constantly, bring them to boiling. Remove from the fire and stir in the egg yolk. When cold, add the vinegar, and beat the oil in gradually, beginning with about a tablespoon of oil at a time.

XXXIII

BALANCED MEALS

Date Tapioca Cream Pudding
Score Card for Meals

A. Prepare and Serve a Luncheon or Supper.

Suggested menu: —

Cream soup
Salad
Bread and butter

or,

Cream soup
Bread and butter
Date tapioca cream

Date Tapioca Cream Pudding.

3 tbsp. minute tapioca or 6 tbsp. pearl tapioca	2 c. milk (or half milk, half water)
$\frac{1}{4}$ c. sugar	$\frac{1}{2}$ c. dates stoned and cut in pieces
Pinch salt	

1 egg

If minute tapioca is used, mix the dry ingredients and add the hot liquid gradually. Cook in a double boiler for fifteen minutes, then add the beaten egg and cook three minutes longer. Stir in the dates. Serve cold.

If pearl tapioca is used, cover it well with cold water and let soak at least an hour, over night if convenient. Count any water not absorbed as part of the two cups of liquid.

B. Score the Meal.

Each member of the class should score the meal, using the following card, then compare notes, discussing the points involved.

Score Card for Meal Service

	Possible Score	Actual Score
1. Menu — pleasing and well-balanced . . .	20	——
2. Economy in planning and selection of food .	15	——
3. Organization of time and work; appearance of kitchen	15	——
4. Appearance of the table	15	——
5. Table service	15	——
6. Success of cooking and preparation . . .	20	——
7. Social grace of those at table: table manners, courtesy, anticipation of needs of others, character and ease of conversation . . .	15	——
Total	100	——

Balanced Meals

A great deal is said at the present time about balanced meals, and many lists of these are published. At first glance the student who knows that a "balanced diet" furnishes a certain number of total calories, — with a certain percentage of these from fats, proteins, and carbohydrates, — and a given amount of mineral elements and vitamins, is puzzled, because these lists say nothing at all about amounts. It must be evident, then, that such meals are not accurately balanced in this sense. They are

balanced in the sense that they furnish all the different elements required and in approximately the correct amounts. Let us see how easy it really is to do this.

Planning for Protein

In "Feeding the Family" Mrs. Rose suggests that an average of a quarter of a pound of lean meat will provide a grown man with approximately one-third of his protein requirement for a day. He will obtain another third from the bread, cereals, fruit, and vegetables that he eats, and the remainder can easily be supplied from a glass of milk, an egg, some cheese, beans, or nuts.

Planning for Mineral Substances

If an adult takes a pint of milk a day (including what is used in cooking) to help provide phosphorus and calcium, and then eats every day one vegetable rich in iron (spinach, cabbage, beans, tomatoes) and uses, as well as potatoes, some eggs, meat, or cereal products containing the bran, his diet is not likely to be deficient in mineral substances.

Planning for Vitamins

If they are properly prepared, the vegetables added to supply iron, and the milk for protein, phosphorus, and calcium, will also supply some vitamins. In general, some fresh fruit or vegetable once a day, and a good serving besides of some other vegetable besides potatoes every day, will take care of the vitamin requirement, so far as we know it at the present time.

Planning for Calories

Usually a person can be depended upon to eat about the right number of calories. However, people who are thin

need to increase their calorie intake to grow fatter. The easiest way to do this is usually to eat more of the foods that are high in calorie value. On the other hand, fat people should eat plenty of fruit and vegetables and avoid rich foods (fats, pastry, sweets) and those containing much starch (cereals, bread, potatoes, cake, and so forth).

Planning Meals in Groups

Meals should be considered not individually, but in groups, meals for the day, for the week. Decide, for example, how much meat you intend to include in the diet of the week, and distribute it accordingly. Some people find themselves best suited with meat only two or three times a week; others desire it at least once a day, while still others prefer it in smaller amounts even more frequently. But as meat is expensive and too much of it is unnecessary and probably not good for us, the skilled menu-maker will devise substitutes which will satisfy her family and gradually change their tastes.

Having selected the meat or meat substitute, begin filling out the meal. Remember that it is wise to distribute the fat so as not to have too much of it in any one meal as it is likely to cause digestive disturbances. In making combinations, do not include in the same meal dishes which furnish practically the same food principles. Rice should be substituted for potatoes and not served with them. Plan definitely to include vegetables and fruits for their mineral content. If meat and nutritive vegetables are to be served, fruits make a suitable dessert. If the dessert, on the other hand, is rich and high in food value, see that the vegetables are less starchy. If little meat is provided and the whole dinner seems too light, the meal might include a hearty soup or salad. Consider-

ing the larger grouping, we should see that the food for the day runs evenly. If a lunch or supper is hearty, the dinner should be lighter than usual, or vice-versa. Alternate days of feast and famine do not give satisfaction.

The suitability of the food must also be taken into account. People who work out of doors most of the time not only need more hearty food, but can digest it better than can those who are more closely confined and have more sedentary habits. For the latter, as for children, easily digested food must be provided.

Planning for Variety

Last, but by no means least, remember to provide variety. First, variety within the meal itself. Not only should the same flavor not appear twice in a meal, as chicken broth followed by chicken, or tomato soup followed by tomato salad, but as much variety as possible in food combinations should be sought. It is evident that a meal must not be composed too largely of liquids, and the dryness or watery character of the food should be considered. Boiled potatoes are more acceptable with a meat with gravy than, for example, with Hamburg steak. Peas and beans at the same time not only provide about the same food elements in the same proportions, but are too much alike. Two creamed vegetables at once are not so pleasing as if one were mashed or served in some other way. Variety in flavor is important. Two strong-flavored vegetables, as onions and turnips, are not acceptable at the same time; on the other hand, if only mild-flavored foods are chosen, the whole is insipid. In food combinations, color, too, should be taken into account. Carrots and cranberries do not make a pleasing color harmony.

Variety also demands that the same foods prepared in exactly the same way should not be served at successive meals. Moreover, the same food combinations should not be repeated too frequently. Do not always serve peas with lamb. Bread and butter are, of course, repeated, but there are innumerable ways of serving potatoes, although if you lived in some families you would think that there were but one or two at most. Left-overs may be made to appear like a new dish, or a meal may be skipped before serving the same article again. Some boarding-house keepers and some housewives, as well, make the mistake of running on a regular schedule so that it is possible to predict the meal beforehand. This is, of course, a grave error.

A warning should be given in regard to variety. The variety desirable is not the serving of too many kinds of food at one meal. Some people, and especially country hotel-keepers, serve at one meal all the vegetables that are to be had, and there is no variety possible for the next meal. Pickles of various sorts, different kinds of jam and preserves, appear all at once at each meal, and one grows as tired of them all as if one had really eaten all the kinds, whereas one served at a time at different meals would have meant a new attractiveness. For this reason it is easy to tire of cafeteria or hotel meals where the food has to be selected before eating.

References

"American Home Diet", by E. McCollum.

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1313. "Good Proportions in the Diet."

Questions

1. Why are the following menus faulty? How would you improve them?

(*a*) Split-pea soup
Roast beef
Mashed potatoes
Baked beans
Banana salad
Plum pudding

(*b*) Bouillon
Bacon and eggs
Buttered beets
Squash
Lettuce salad, French dressing
Baked apple and whipped cream

(*c*) Roast lamb
Macaroni
Creamed potatoes
Boiled rice

2. Plan meals for a day that would give an abundance of the four mineral substances which are likely to be present in our foods in insufficient amounts. Underline each food that supplies these elements and write in parenthesis after each food just which of these elements it supplies.

3. See whether the meal plan that you have just made also furnishes some of each of the three vitamins. If not, can you change it so that it is right for both?

4. Does the meal plan furnish enough protein?

5. Are the meals attractive?

Home Work

If possible, try preparing the meals that you planned above. Make a working-plan for each meal before you prepare it. It may be impracticable for you to try to prepare all three meals on the same day, but perhaps you can do one one day, and the others later. See what improvements you think could be made in them. Could they be made less expensive without spoiling them?

XXXIV

STRUCTURE AND COMPOSITION OF MEAT

Meat Cakes with Creamed Turnips
Beef Loaf

A. **Class Experiments.** Tests with Meat.

Soak some ground meat for a few moments in a little cold water. Pour off the liquid and divide it into two parts.

1. Test one part by boiling it with a few drops of nitric acid, and then cooling it and adding ammonia. Test, in the same way, a bit of the meat fiber from which the juice has been soaked out. Recall and compare with the experiment on egg white.
2. Heat the other portion to simmering and observe. Then boil it. Compare with the experiment on egg white.

B. **Class Experiment.** The Structure of Meat.

1. Scrape a small piece of raw beef in the same direction as the fiber with a dull knife, and notice the structure. Can you see any fat among the fibers?
2. Draw a muscle fiber as it appears under the microscope.

C. Prepare Broiled Meat Cakes.

1. Grind the beef, season with salt, and pepper if desired, and shape lightly into small flat cakes. Grease a frying pan lightly (a piece of the meat fat may be rubbed over the hot pan), and broil the cakes. Serve with creamed turnips.

Meat

The flesh of all animals may be correctly spoken of as meat, but in a narrower use of the term we refer to the flesh of cattle, sheep, and pigs. Young beef is called veal; young sheep, lamb; older, mutton; while the flesh and fat of pigs are called pork. In the following discussion the term "meat" is used in its narrower sense.

Structure and Composition

Meat is made up of fibers which are embedded in and held together by connective tissue. The fibers are hollow, with walls composed of the protein substance called elastin. This elastin, like many other proteins (recall the egg-white experiment), becomes tougher on being heated to a high temperature. In boiled beef these tough, stringy fibers are quite evident. This is because the connective tissue that holds them together has broken down, for connective tissue is composed of two proteins, collagen and elastin, and collagen, when it is boiled with water, breaks down and forms gelatin. This allows the fibers to be more easily separated.

Inside of the fibers is much juice. It is composed of water in which are coloring matter, salts, extractives, and at least two proteins which coagulate with heat just

as white of egg does. One of these proteins is called albumin, the other, myosin.

Besides these substances, meat also has fat deposited in it in varying amounts, mainly in the connective tissue. In beef, the fat is usually in sufficiently thick layers to be seen readily; in pork, the fat surrounds the fibers in such small particles as not to be visible, although present in generous amount.

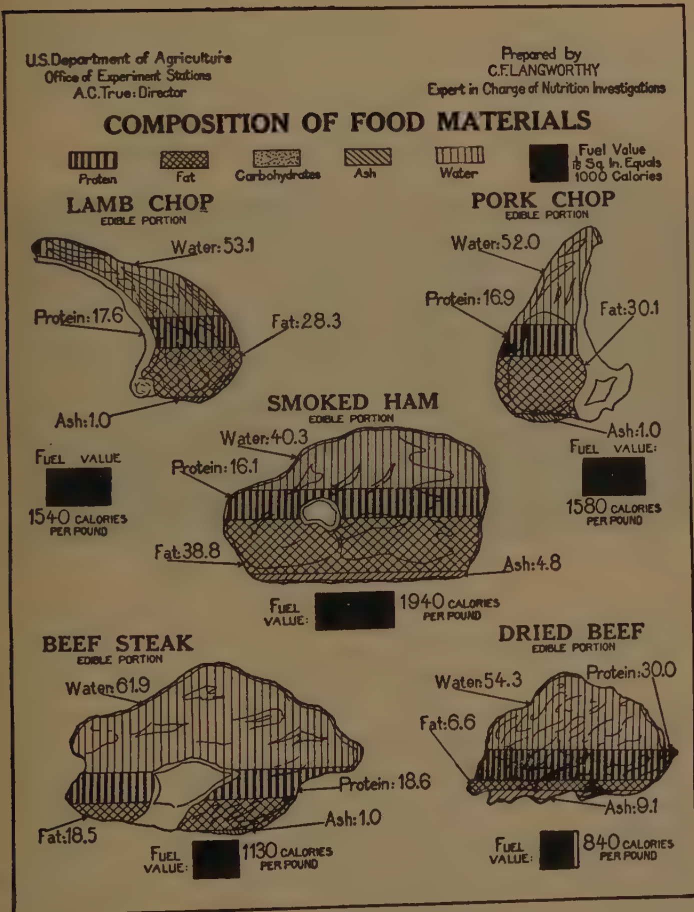
The extractives, so named because they can be extracted from the meat by boiling it in water, are of value because they give the meat its flavor. It is these extractives which give the characteristic flavor to meat soups. Although extractives contain nitrogen, they have practically no food value, since they cannot build tissue nor furnish heat to the body. They are stimulants, however, and cause a flow of digestive juices in the stomach, which aids in the digestion of food; but in too large quantities these substances possibly produce in our bodies disorders of one kind or another.

Shortly after an animal is slaughtered a condition known as rigor mortis sets in, during which the muscles are very stiff. Meat must be eaten either before this begins, or after the meat has hung for a while. In hanging, acids develop which perhaps aid in softening the meat again, and certainly add to its flavor.

Lean meat shows about the following composition:

Edible Meat

Water	75.0% to 77.0%
Mineral matter	0.8% to 1.8%
Fat	0.5% to 3.0%
Muscle fiber	13.0% to 18.0%
Connective tissue	2.0% to 5.0%
Extractives	0.5%



COMPOSITION OF MEAT

Tough and Tender Meat

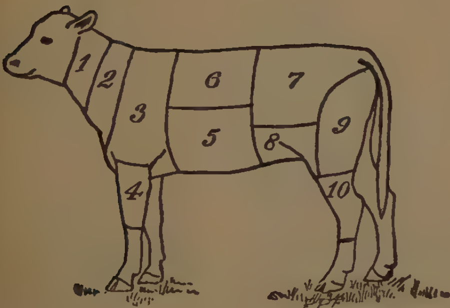
The cuts of meat which are tender usually command the highest price. They come from the parts of the animal which are least toughened by exercise, but there is considerable difference in tenderness in the "better cuts"; breed, age, size, and the manner in which the animal has

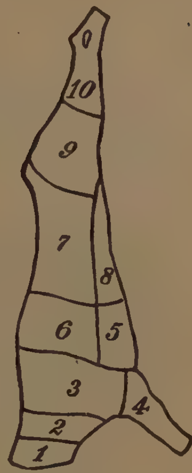
Kidney Rib French

LAMB CHOPS

been fattened, all affecting the result. The length of the fibers seems to be another factor in the question of toughness. Loin steaks and rib roasts are good examples of choice cuts. It is interesting to know, however, that many of the cheaper cuts contain more extractives and less water, so that they are both better flavored and more nutritious. Waste, too, must be taken into account. Instructive data on this subject can be obtained in Bulletin 158, of the Illinois Agricultural Experiment Station.[1]

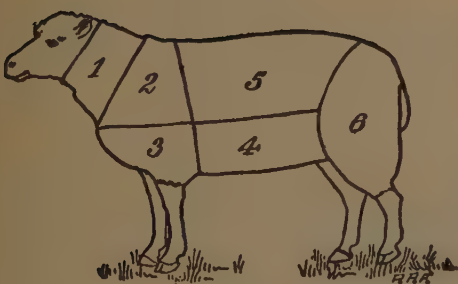
[1] Quoted in Sherman's "Food Products", 2d Ed., pp. 239–245.

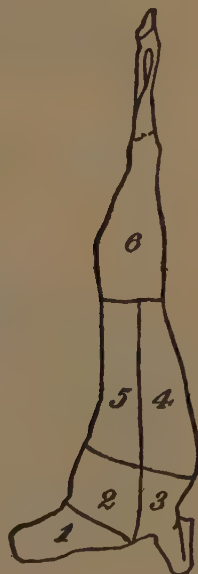




1. Neck.
2. Chuck.
3. Shoulder.
4. Fore shank.
5. Breast.
6. Ribs.
7. Loin.
8. Flank.
9. Leg.
10. Hind shank.

CUTS OF VEAL





1. Neck.
2. Chuck.
3. Shoulder.
4. Flank.
5. Loin.
6. Leg.

CUTS OF MUTTON AND LAMB

How to Select Good Meat in the Market

Experience is needful before one can recognize good meats in the market. This can best be acquired by getting a butcher to show different grades of meat, and to explain why one is better than another. Here are some of the chief points to be noted.

Beef

The meat should be bright red after standing, but it will be purplish red if recently cut. It should be fine-grained, firm, and the lean well mottled with fat. Coarse, flabby, dark beef is poor meat; if it lacks fat, it is underfed or old.

Veal

"Bob" veal — calf less than three weeks old — is generally excluded from market; the meat from an animal about two months old is considered best. It is much paler than beef, and shows no mottling of the lean with fat. It should be pinkish and fine-grained.

Mutton

This is from sheep at least three years old. It should be fine-grained and pinkish red, with hard white fat.

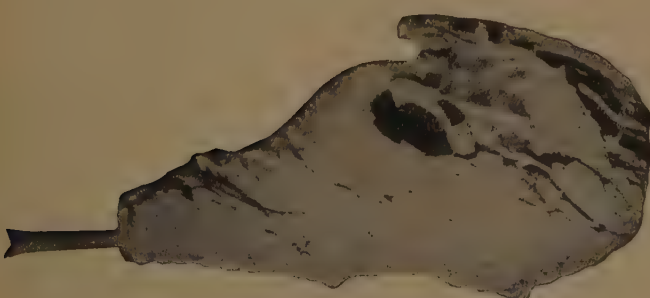
Lamb

Spring lamb is supposedly from an animal eight weeks to three months old, and any lamb less than a year old. The meat differs in color from mutton, but the two are more easily distinguished by the bone. In lamb, this is pinker and ridged or saw-like at the joint of the leg. In mutton, the bone is whiter and smoother and less ridged.

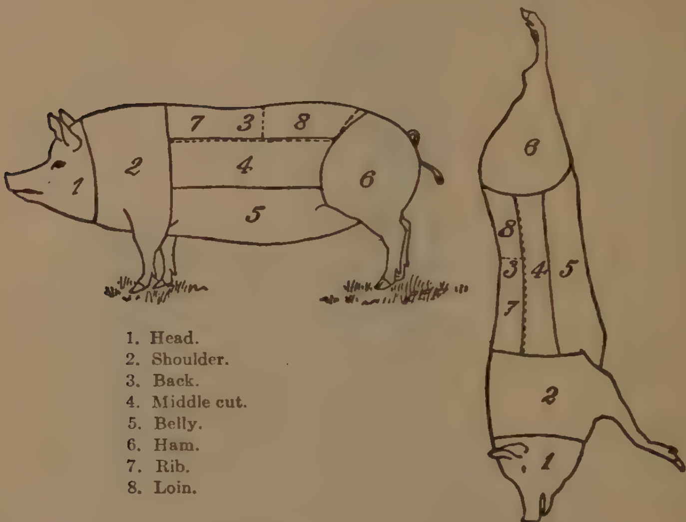
Pork

The meat should be fine-grained and firm, and the fat should not be soft. The meat is very pale.

CUT KNOWN AS FORE QUARTER, BREAST, AND BACK OF LAMB OR MUTTON



LEG OF LAMB OR MUTTON



1. Head.
2. Shoulder.
3. Back.
4. Middle cut.
5. Belly.
6. Ham.
7. Rib.
8. Loin.

CUTS OF PORK

Care of Meat

All meat requires constant care, as it spoils easily. It should be kept in a cool place and not left wrapped in paper. If placed directly on the ice, much juice is lost. It should not be exposed to flies. Before being cooked, it should be wiped with a damp cloth. In washing it, do not soak it in water. However, meat which has become slightly tainted may be washed with water in which a little cooking soda has been dissolved. A much better plan is to preserve the meat from becoming tainted. If it must be kept, cook it slightly. Since meat spoils first on the outside — especially in crevices around the bone — this helps the meat to keep.

References

U. S. Dept. of Agriculture.
Farmers' Bulletin No. 391. "Economical Uses of Meat in the Home."
Farmers' Bulletin No. 1324. "Lamb and Mutton and Their Use in the Diet."

Questions

1. Account for the yellow stain nitric acid leaves, if you spill it on your hands.
2. Does tender or tough meat contain more connective tissue?
3. If much-used muscle is tougher, which parts of a steer or sheep would you expect to find tough? Which tender?
4. Is tender or tough meat likely to be the more juicy?
5. For what reasons should meat be unwrapped before it is put away when it comes from market?
6. Why, before cooking, should meat be wiped with a damp cloth rather than washed?
7. Which foodstuff is practically absent in meat? Mention foods served with meat, which would be particularly adapted to make good the deficiency.

Home Work

Prepare meat-balls or beef loaf for dinner.

Meat Loaf.

1½ lbs. ground beef (round steak)	½ c. water
½ c. soft bread crumbs	2 tsp. salt
1 chopped onion, if desired	2 or 3 slices of bacon (or salt pork), or two tbsp. of butter
1 egg	Boiling water

Beat the egg slightly with the half cup of water, and add the meat, bread, onion, and salt. Mix the ingredients together thoroughly and then shape them into a long roll. Place the roll in a baking pan, if convenient on a rack, and then either cut the bacon into narrow strips and lay them

crossways over the top, or dot the top over with small pieces of butter. Pour boiling water over the loaf until you have about a half-inch of it in the pan. Bake the meat for three-quarters of an hour, dipping up a little of the water in the pan and pouring it over the meat two or three times during the cooking.

When the meat is done, remove it from the pan, measure the water left, and make gravy by adding two tablespoons of flour for each cup of liquid. Stir the flour with a little cold water before you add it to the gravy. Stir over the fire until the gravy boils and thickens.

XXXV

CUTS OF MEAT

TENDER MEAT

ROAST BEEF
BROILED BEEFSTEAK AND CORN PUDDING
PAN-BROILED AND BREADED CHOPS AND STEAK

A. PREPARE ROAST BEEF.[1]

Weigh the beef before and after cooking. Wipe beef and, if necessary, skewer into shape. Dredge all sides with salt, pepper, and flour. (Why are these added?) Insert a thermometer with a bulb in the center of the roast. Place fat side up, in a hot oven at 428° F. for fifteen minutes, then reduce the heat to 342° F. and cook until the inner temperature of the meat as shown by the thermometer reaches, if rare is desired, 131° to 149° F.; if medium, 149° to 158° F.; if well-done, 158° to 176° F. If meat is quite lean, it may be necessary to add fat to the pan. If very dry, add a little water. This is undesirable, as it may give the beef a "stewed" flavor.

Let the thermometer remain in for some time after the meat has been removed from the oven. Explain the change in temperature which takes place.

[1] The roast can be cooked rare and used for left-over meat.

Calculate the length of time necessary for each pound of meat roasted rare, medium, or well-done. Why is the meat put into a very hot oven at first? Why is the temperature lowered later?

B. **Class Experiment.** COOKING MEAT.

1. Sprinkle a bit of raw meat with salt. What effect does the salt have upon the juices of the meat?
2. Take two small pieces of meat.
   a. Put one in a cold frying pan and cook it, heating slowly at first.
   b. Put the other in a hot frying pan.
   Explain why the juices flow in one case and not in the other.

C. PREPARE BROILED BEEFSTEAK. When will you salt it? Serve with corn pudding.

CORN PUDDING (CORN À LA SOUTHERN).

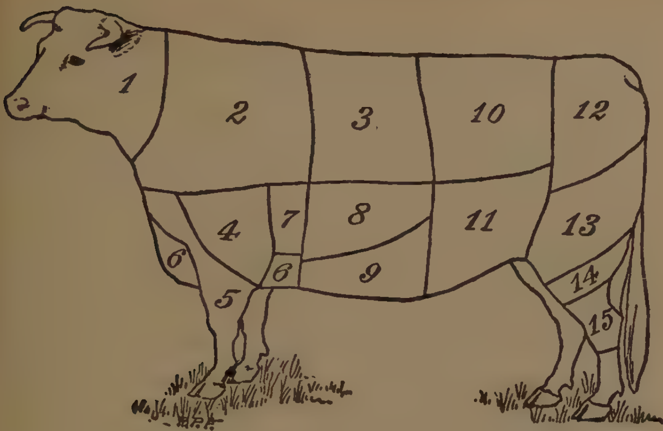
To one can chopped corn, add two eggs slightly beaten, one teaspoon of salt, one-eighth teaspoon pepper, one and one-half tablespoons melted butter, and one pint scalded milk; turn into a buttered pudding-dish and bake in slow oven until firm.

From the "Boston Cooking-School Cook Book." By FANNIE M. FARMER.

CUTS OF BEEF AND PRINCIPLES OF COOKING MEAT

Cuts of Beef and Their Use

Beef is not always cut up in exactly the same way. In general, the carcass is first split into two "sides" of beef, then divided into the fore and hind quarters. From the



1. Neck.
2. Chuck.
3. Rib.
4. Shoulder clod.
5. Fore shank.
6. Brisket.
7. Cross ribs.
8. Plate.
9. Navel.
10. Loin.
11. Flank.
12. Rump.
13. Round.
14. Second cut round.
15. Hind shank.

CUTS OF BEEF

fore quarter are cut rib roasts and chuck. The first ribs cut off are the best, known as "prime." The chuck ribs may also be used for roasts or steaks. Brisket, shoulder, clod, cross-ribs, plate and navel are all used for corned beef; and they, as well as the neck and shank, are used for stews, ground meat, or soup meat. The shank is used for soups.

The hind quarter consists of loin, rump, round, flank, and hind shank. The loin furnishes the choicer steaks, club, porterhouse, and sirloin, which are cooked by broiling, or cut into roasts. The rump is used for steaks and roasts, but is not considered so choice as rib and loin. It furnishes much edible meat for the price paid; however, it is somewhat coarse. The round is divided into parts called "top" and "bottom", as the meat lies on the butcher's table in being cut. "Inside" and "outside" would mean more in locating the cut. The top is much the tenderer of the two and is sometimes used for steaks and roasts, while the bottom of the round serves for stews and Hamburg steak. The flank is sometimes sold as flank steak, but needs to be cut and pounded to make it tender. It is more often used for stewing or corning.

The other parts of beef also used for eating are the heart, liver, kidneys, brains, tongue, tail, and tripe (the lining of the stomach).

How to Keep Meat Tender

It will be noticed that the more tender meat is reserved for roasting and broiling. This means for the bulk of the meat the use of a low temperature. Notice that, even in a well-done roast of beef, the internal temperature is below the simmering point of water. The surface, to be sure, is exposed to very high temperatures and is correspondingly

toughened, but this small sacrifice is in order to furnish flavor, also in order to coagulate the proteins near the outside and so confine the juices. Stewing or boiling, and pot-roasting or braising (which is really steaming and stewing) are the methods employed in cooking tough meat. In all these, the meat is exposed to a much higher temperature than is used in cooking tender meat. Muscle fiber is such a poor conductor of heat that in roasting and broiling only the outside is much heated. But in the other methods, the water or steam penetrates into the meat, carrying heat with it. This gives a temperature high enough, with time, to soften connective tissue or even gelatinize it. The fibers, however, are not dissolved and are always tougher than in more tender meat; but, on the whole, the general effect is better than can be obtained by treating such meat as a better cut.

Since heat toughens meat, special care needs to be exercised in the preparation of left-over meats. If the meat is tender and already well cooked, it should be reheated but not recooked; if tough or insufficiently cooked, it should be simmered until tender.

Since tenderness is such a desirable characteristic that it is the one on which price is based, great pains should be taken not to toughen choice cuts of meat in cooking, and to prepare the tougher cuts so that they may be as desirable as possible. Many cooks woefully fail in this respect.

References

As in last lesson. (Farmers' Bulletins No. 391 and 1324.)

Questions

1. Would you need a hotter or a cooler oven to roast two pieces of beef to the same degree, if one piece were very large and the other very small?
2. How thick should steak be cut?

3. If you wish steak well done, will you merely cook it longer?
4. To what is the loss in weight due in roasting beef?
5. Which cuts of beef furnish the most lean meat for the price paid?

Home Work

1. Go to market as often as you can. If possible see a side of beef cut up. Look at the different cuts of meat until you can recognize them. Find out what each costs a pound. Taking into consideration the amount of waste in each piece, make up your mind which is more economical to buy for a given purpose.

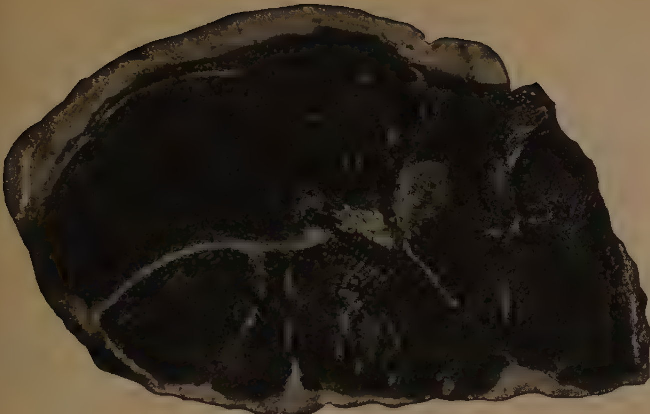
2. Lamb chops may be broiled like beefsteak, or both may be pan-broiled.

Pan-broiled Meat.

Rub the bottom of a frying pan with a piece of fat from the meat, or grease it about as you would a cake pan. Get the pan very hot and then put in the meat. When meat is browned on one side, turn it and brown it on the other, then reduce the heat and finish cooking. Lamb chops and steak cut medium thick take from ten to twelve minutes to cook; pork should be cooked thoroughly, from twenty minutes to half an hour.

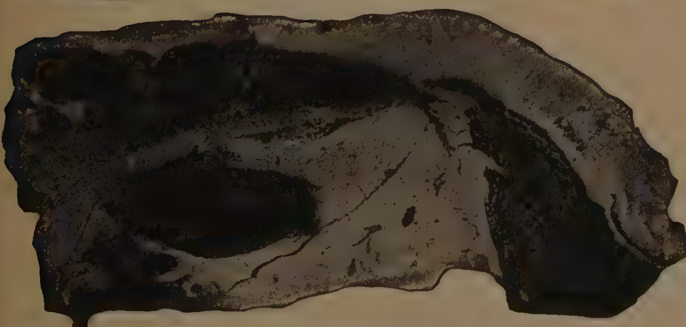
Breaded Veal Chops and Steak.

Veal chops and steak are often "breaded." Since veal needs to be well done, it is usually cooked first in boiling water until it is tender. Save the water. Then sprinkle the meat with salt, dip it into flour on both sides, then into an egg beaten slightly with a tablespoon of water, and finally into fine bread crumbs or cracker crumbs. Place three or four tablespoons of fat in a frying pan, and when the fat is hot, brown the breaded meat on both sides.



Round Steak

Club Steak



Porterhouse Steak

TYPICAL CUTS OF STEAK

The meat is good served with tomato sauce. Use the water in which the meat was cooked, either for soup or in making a sauce for the meat.

Tomato Sauce.

Make a medium white sauce, but use for half the liquid canned tomatoes, for the other half the water in which the veal was cooked. If you like the flavor, you can brown a couple of slices of onion in the fat before you add the flour. Strain the sauce through a coarse strainer when it is done.

XXXVI

MEAT INSPECTION

Beef Stew with Dumplings
Swiss Steak
Hungarian Goulash

A. **Class Experiments.** Cooking Meat.

1. Sear a small piece of meat in a frying pan. Pour half a cup of cold water over it and simmer for half an hour.
2. Repeat with a piece of meat the same size and shape, but omit the searing.

Compare the appearance and taste of the resulting broths. Cut the meat open and see whether one tastes or appears different from the other.

B. Prepare Beef Stew.

1 lb. beef, from rump, round or shoulder
2 c. diced carrots
2 c. diced turnip
1 onion
4 or 5 potatoes
(carrots, turnip, onion, potatoes:) Pared and diced
2 or 3 stalks of celery cut in small pieces

Cut the beef into small cubes. Season each piece highly, dredge with flour, and brown on all sides in a frying pan with a little suet. Put the meat and the bone, if

there is one, into a saucepan with a cover, add enough water to cover meat (reserving one piece for the next experiment), let it come rapidly to the boiling point, then simmer or finish the cooking in a double boiler until tender. At least two hours is necessary. Add water if needed. Before the stew is finished, diced vegetables, such as carrots and potato, may be added, and twenty minutes allowed for them to cook. If the gravy is not thick enough, a little flour and water may be added. This should be done before cooking the dumplings. If left-over roast beef is used, will it be necessary to brown it? Should the left-over gravy be added?

C. Serve the Stew with Dumplings.

2 c. flour	½ tsp. salt
4 tsp. baking powder	⅔–¾ c. milk

Sift together the flour, baking powder, and salt; then stir in enough milk to make a soft dough.

1. Drop a spoonful of the mixture into the stew, covering it with the gravy.
2. Drop the rest by spoonfuls over the meat in the stew in such a way that the dumpling is held well out of the water.
3. Cover tightly and simmer for fifteen minutes without removing cover.

In which case is the dumpling soggy?

D. **Class Experiment.** Keeping Meat Tender.

To see why meat is simmered instead of boiled, boil the cube of meat reserved from (*B*) for an hour, and then compare it with a piece of meat from the stew which has been cooked the same length of time.

Meat Inspection

Our Meat Consumption

Not only is the slaughtering and packing of meat the largest manufacturing process in the United States, but our consumption of meat is very great. Reports for the United States Department of Agriculture estimated the per capita consumption of beef, lamb, mutton, pork, and veal in 1900 as 178.75 lbs., while that of Great Britain was only 122 lbs., Germany 99 lbs., and France 80 lbs. Moreover, about a third of all the expenditure for food materials is spent for meat. When this is realized, as well as the fact that meat is one of the foods "most subject to conditions rendering it unwholesome or even dangerous", it is no wonder that the Federal government yearly appropriates a large sum of money for meat inspection and makes the penalties for violation of the meat-inspection law much more severe than for violation of the other food laws.

Why Meat Is Inspected

Meat may be dangerous, first, because animal parasites may be present, such as trichina in pork; or, second, because bacteria may be present. The latter may be dangerous for two reasons. They may be bacteria causing diseases which are capable of being communicated through the eating of the flesh, or they may be bacteria which produce poisons or ptomaines in the meat, which, if eaten, may cause illness or even death.

Federal inspection excludes from interstate commerce and exportation all meat found unfit for food, and allows only meat to be sold which is considered as coming from healthy animals, slaughtered under sanitary condi-

tions. Since meat is an ideal culture medium for bacteria, it is necessary not only to see that it is from healthy animals but that it is not infected afterwards. Such infection could easily take place if flies and dust were allowed, or if the meat were handled by men with unclean and infected hands. What infection may mean is evident from recent studies made on Hamburg steak, which report as high as 525,000,000 bacteria to a gram of meat, even average samples showing about 10,000,000. Fortunately these are not usually bacteria which cause disease or produce ptomaines.

State as Well as Federal Inspection Necessary

As they know of this government inspection, many people have an unwarranted feeling of safety in buying meat. Too often it is not realized that the Federal government can control only those slaughter houses which send meat into interstate commerce. Smaller houses, selling in one State only, are not under Federal jurisdiction at all. Hence, State and city inspection laws are also necessary.

References

U. S. Dept. of Agriculture. Yearbook, Separate No. 714.
"The Meat-Inspection Service of the United States Department of Agriculture."
"Food Products", by H. C. Sherman, 2d ed., pp. 223–227.
Commercial geographies.

Questions

1. What advantages are there in serving meat cooked, instead of raw?
2. What methods of preserving meat are allowed by the Federal law?
3. Is there any limit to the time meat may be kept in cold storage before being sold?

4. What are the causes of the increased cost of meat?
5. What trade in meat has the United States with other countries?

Home Work

1. How much Hamburg steak would you buy to serve four people? How much tenderloin? How large a roast of beef? How heavy a leg of lamb?
2. Make a list of the different cuts of a side of beef and write beside each cut the appropriate uses to be made of it.
3. Prepare one or the other of the following dishes:

Swiss Steak.

1 lb. round steak about an inch thick
¾ c. flour
½ onion
½ tsp. salt
2 tbsp. fat
½ c. water or tomato juice

Sprinkle the flour over the meat and pound it in, first on one side and then on the other, with the edge of a saucer. Put the fat in a frying pan, and when it is hot add the meat (sprinkled with salt) and the onion, then pour over it the liquid. Let the meat simmer for two hours, adding water as needed to prevent burning.

Hungarian Goulash.

1½ lbs. round steak
1 onion, sliced
1 tbsp. fat
2 c. diced carrots
2 c. diced potatoes
½ can tomato
2 tbsp. flour

Brown the onion in the fat, add the steak, and when it is brown on both sides, cover it with water and let it simmer

for half an hour. Then add the carrots and potatoes and simmer for an hour longer, adding water as necessary. Finally add the tomato and the flour stirred in a little cold water. Let the goulash come to boiling after the flour is added.

XXXVII

COMPLETE PROTEINS

Use of Left-Over Meat

Southern Spoon Bread

A. Left-overs. Every student is to come to class ready to prepare some dish from "left-over" meat.

Suggestions for Using Left-over Meats.

1. *Stews*, *Fricassees*, and *Casserole Dishes* made with rice or hominy or dumplings or baking-powder biscuits or vegetables. Chop and add the cooked meat just long enough before the rest is done to warm thoroughly.
2. *Hash* — minced meat warmed in gravy, or moistened with water and heated up in a little fat, served on toast, or mixed with finely chopped potato and sautéed.
3. *Creamed Meat* served with white, brown, or tomato sauce. Served plain or on toast, in toast boxes or patty shells, or in nests of potato, rice, hominy, spaghetti, and so forth.
4. *Scalloped Meat* — creamed, covered with buttered crumbs, and baked. The meat may be mixed with

vegetables or put in alternate layers with rice, macaroni, and so forth. Gravy or tomato sauce may replace the white sauce.

5. *Meat Soufflé.* Meat chopped and mixed with thick white sauce and beaten egg. Meat may be mixed with chopped vegetables or with rice.
6. *Meat Pies* made with potato crust or pie crust. The meat may be mixed with vegetables.
7. *Meat Salads,* usually mixed with chopped vegetables or with rice.
8. *Chopped Meat* used for stuffing onions or green peppers, or stirred into scrambled eggs, or folded into omelet.
9. *Meat Soups* made with cereal (rice, hominy, barley, tapioca, and so forth, or left-over breakfast foods) and almost any vegetables.

B. Spoon Bread. Serve the dish prepared in (*A*) with Southern Spoon Bread.

Southern Spoon Bread.

2 c. corn meal	1 tsp. salt
$\frac{1}{4}$ c. flour	1 tbsp. melted fat
Boiling water	$2\frac{1}{8}$ c. sour milk or buttermilk
1 tsp. soda	1 egg, beaten slightly

Mix the corn meal and the flour, put in a strainer, and pour boiling water over the mixture. Let it drain, add the other ingredients, and bake in a buttered dish until it is of the consistency of a firm mush. Serve with gravy or jelly.

Complete Proteins

In order to understand the place of meat in the diet, one needs to know a little more in regard to the proteins.

Classification of Proteins

American physiologists are using the classification of which a simplified form is given here. The proteins are divided into three main classes:

I. Simple proteins, which are found as such.

- *a*. Albumins — as found in egg white, in meat, in wheat, in milk, and in many other protein foods.
- *b*. Globulins — of which the myosin of meat is a good example. It is also present in small quantities in egg white and in wheat, as well as in many other foods.
- *c*. Glutelins.
- *d*. Alcohol-soluble proteins.

  Gluten from wheat is made up of two proteins, glutenin which belongs to group (*c*) and gliadin which is an alcohol-soluble protein of group (*d*).
- *e*. Albuminoids — of which collagen, elastin, and ossein of bone are examples.

II. Conjugated proteins — which are proteins linked with some other substance. Casein, which is protein linked with a phosphorus compound and is the chief protein of milk, is one example. Hæmoglobin, which is protein linked with the coloring matter of blood, is another.

III. Derived proteins. These are formed or derived from the others. For example, in digestion proteins are changed first into meta-proteins, then into proteoses and peptones; these last three are all derived proteins. When protein is coagulated, as egg white when it is cooked, it becomes a derived protein.

Complete Proteins

All these proteins can be broken down into still simpler compounds which are called amino acids, and this action is probably largely carried out in digestion. Then the body takes these amino acids and builds them up into body proteins. Not all of the proteins found in food contain all the different amino acids which the body needs. Scientists have tested the efficiency of different proteins in feeding-experiments with animals, and have divided them into two general classes: complete proteins, which seem to contain all the needed amino acids and to be able therefore to build body tissue; and incomplete proteins, which cannot be built into tissue unless they are supplemented by other proteins which contain the amino acids they lack. Of course, sometimes it may be a question of an insufficient amount of some of these acids rather than of a total absence of them.

In our classification elsewhere you will see that the second group of foods is named the Complete Protein Group. That is because these foods contain either complete protein or combinations which are efficient. The protein supplied by our cereals is not efficient by itself unless it is supplemented. Nevertheless, it is excellent food and, as we have already said, is usually the source of at least a third of the protein of our diet. But even rather small amounts of milk, eggs, or meat make an efficient combination with it and enables the protein of the cereal to be used for body-building. Meat, however, does not supplement the lack of mineral substances and vitamins.

It had long been known that gelatin alone would not support life, and so for some time gelatin was not classed as a protein at all. Now it is known by analysis that the

difficulty with gelatin is that certain of the amino acids which should be found in a complete protein are absent. But this does not make the acids which are present of no value; it merely means that gelatin is incomplete by itself and should be supplemented by proteins which contain the missing amino acids.

Amount of Protein Needed

As the body proteins are many, and also varied in the kind and amounts of amino acids they contain, it will easily be seen why it is so difficult to state an exact amount of protein which is needed daily in the diet. It undoubtedly makes a difference what the proteins are that are eaten. Since so little really is known about the whole matter, we have here one of the best arguments for variety in diet, that all the needed substances may be present; and one advantage in using milk in the diet is that casein, the chief protein in milk, is itself a complete protein.

Value of Meat in the Diet

Protein in the form of meat is expensive, so it is wise to know just how far from necessary it is. Most people regard meat as an indispensable article of diet. They think it is necessary to make people strong and well. We read of the vigor of the old English yeomanry and how their sturdiness was due to the beef and ale of England. We have surely dropped the notion of ale or beer as strengthening, so we believe perhaps the more firmly in meat. But anyone who studies the real conditions of English life during the Middle Ages knows that the poorer classes were fortunate if they had meat once a week; moreover, doctors and others who are experimenting on the subject say that many of the ills which were formerly

believed to be due to insufficient protein in the diet are really due to lack of mineral substances and vitamins.

Vegetarians have proved that meat-eating is not essential to life and scientists are ready to admit this fact, but on the other hand, no meat in the diet means most careful planning to include sufficient proteins in efficient combinations; and it is true that people like meat, and the dominating races of the world are meat-eaters, although we are not sure whether that is true because of, or in spite of, that fact.

So far as is known, there is no essential difference between proteins from vegetable sources and from animal sources, but it is true that because of the way they are combined, the latter are often much more completely absorbed and, perhaps, are more quickly digested as well. Many people who argue for vegetarianism are advocates of it only in its modified form; that is, they believe in the use of milk and eggs, but not in the use of meat and fish, which involves the sacrifice of life. There is little evidence that the vegetarians are really any better off physically than the meat-eaters. There is some evidence that endurance is better in those who eat less protein than in those who eat much, but this is entirely aside from the source of the protein. Fisher, at Yale University, has tried experiments in which people who ate less protein showed much greater ability to carry on given exercises than did those who habitually used more protein. Such tests as deep knee-bending, leg-raising, and holding the arms out horizontally, were tried. Not only could the low-protein consumers hold out longer, but they were less exhausted afterwards and suffered less from sore muscles. Whether this effect is due to the lack of alkaline salts in meat, to a lack of vitamins, or to some other cause, is not known. However, considering all the evidence, it would

seem as if Americans at least would do well to lessen the amount of meat they habitually consume. As we are the greatest meat-eaters among the civilized nations, it would seem that this could be done with perfect safety and possible benefit.

Do Growing Children Need Meat?

Mrs. Rose in "Feeding the Family" advises against giving meat to children until they are seven years old. She says they not only do not need meat earlier, but that if they are given meat at an early age they are likely to acquire a taste for it and refuse to drink milk, which is much more necessary to them. Most authorities do not forbid meat to children, and perhaps withholding it to this age is extreme, but the opinion is cited to show that meat is not the absolute necessity so many people believe.

Why Too Much Meat May Be Injurious

It is claimed that the undue eating of protein is a strain on the kidneys which must excrete the nitrogenous products from the body. This cannot be proved, perhaps, but we know that certain diseases, either the result of uric acid production or of putrefaction in the intestines, seem to occur more often in the people who have eaten large amounts of protein in meat. We also know that eating meat tends to reduce the alkalinity of the blood, and that if meat replaces too much fruit and vegetables this may be a source of danger. Then, as we have already said, people who eat less protein seem to show more endurance than those who eat large amounts of protein; they tire less easily and do not get nearly so stiff and sore after severe exercise.

Meat Is Expensive

Meat is a very expensive part of our diet. A large share of the total amount which is spent for food is paid for meat. In normal times, they tell us, this should not be more than one-sixth of the total expenditure for food, but in many households at least a third of the food money is spent for meat.

At the present time, meat is usually high and scarce because of the recent epidemic of foot-and-mouth disease which destroyed so many cattle. Nor is it probable that we shall ever have very cheap meat again, because, as the large ranges of Western land are brought under cultivation, there is less area for free feeding, and food for cattle becomes expensive.

References

"Feeding the Family", by M. S. Rose.

Questions

1. Why is casserole cookery especially adapted to the preparation of tough meat?

2. Make a table showing the cost per pound of the best, of a fairly desirable, and of a cheap cut of beef, veal, mutton, lamb, and pork. Also show the cost of liver, kidney, tripe, heart, sweetbreads, tongue, brains, ham, and sausage.

Home Work

1. In the next week or two, see how many different dishes you can make from left-overs. Report your successes at school. It is great fun to try one's ingenuity in this way, and it is surprising how good such food can be made to taste.

XXXVIII

MEAT SOUPS

A. **Class Experiment.**

THE SOLUBLE CONSTITUENTS OF MEAT.

1. Place a two-inch cube of beef in a third of a cup of cold water. Let it soak half an hour, then heat slowly to boiling, noting (1) the temperature at which coagulation takes place and (2) that at which the color changes. Continue heating for ten minutes.
2. Cook a second cube of exactly the same size as in (1), but do not soak it.
3. Take a third cube like the others, grind or chop it into very small pieces, and cook as in (1).

Compare the resulting broths.

B. PREPARE SOUP.

Allow a pint and a half of water for each pound of meat and bone. This may be beef, veal, or mutton. Remove the fat by passing a small piece of ice, wrapped in a cloth, around on the surface of the soup. Divide into two portions.

1. Clear the first portion with the white of an egg. Beat the egg slightly and crush the shell, allowing one egg white and shell to each two quarts of soup. Add

to the soup, bring slowly to the boiling point, and skim, or strain through cloth.

2. Serve the second portion with vegetables, or rice, or macaroni, or barley.

C. **Class Experiment.** THE USE OF BONES IN SOUP.

Examine the structure of a piece of bone. Put two pieces as nearly alike as possible to soak, one in dilute hydrochloric acid, the other in water. Let them stand in a cool place for several days. Compare the results. On what has the acid acted? Examine the ossein which is left. Now cook each bone separately in just enough water to cover and until the water is boiled down to one-half the amount. Let cool. Compare the consistency.

MEAT SOUPS

Meat Extracts Not Strength-Givers

Liebig, who is sometimes called the father of organic chemistry, taught that protein was the sole source of muscular energy, and that meat extracts were of great nutritive value. Even Liebig afterwards realized that this last was wrong, that the meat extract was a stimulant instead of a food. But notwithstanding, the notion was held in popular opinion for a long time, and some people to-day still believe the meat extract gives strength to invalids. True meat extracts are mainly composed of the flavoring matter of meat with some mineral salts. Practically no fat, no gelatin, nor other proteins are present. We can see readily that this means no real food value. The extracts may have their place, however, as stimulants. They are often fed to invalids under special conditions, or used to flavor soups or sauces.

Meat Broth and Beef Tea

Only slightly more nutritious are the home-made meat broths and beef tea. They contain some protein, partly gelatin, and a little fat, but are, after all, mostly water. A pint of beef broth, made from a pound of beef and a half pound of veal bone, shows less than one and a half per cent of protein and about one and a half per cent of fat, and although a strong soup, it contains over ninety-five per cent of water. As soups may contain even ninety-eight per cent of water, it is quite evident that anyone fed on beef broth would not be getting much food.

Meat Juices

Meat juices, both home-made and preserved, contain more nutriment. The home-made juices differ according to the cut of beef used and the method of extraction. They average about five per cent of coagulable protein. But Hutchison calculates that about three pints of such juice would be necessary to feed an invalid for a day. While the commercial beef juices run higher in protein than those extracted at home, their cost is very great. Hutchison suggests, therefore, the substitution of egg white with water flavored with beef extract, when beef juice is especially called for.

The Real Use of Such Substances

It is evident that meat broths, extract, tea, and the like, are all low in food value. Nevertheless they may have a place in the diet. They are used sometimes with other food to stimulate the flow of the digestive juices and to act as appetizers. This is their logical use at the beginning of a dinner. Because they are really light food, they

are better before a hearty meal than a thickened cream soup, or a purée. Sometimes they are used when it is better for the patient not to have much to eat, to satisfy his desire for food. Suppose, for example, that a person has broken a leg and is laid up for a while. It is difficult to make such a person, not sick and with a normal appetite, realize that he is better off with less food than he needs when he is more active. Here, broths and soups and beverages are an aid in adding bulk to the diet, without furnishing too much food.

If meat broths contain so little nutriment, evidently the meat used to make them is almost as nutritious as before it was used. It has lost flavor and needs to be made palatable, but with proper treatment is still valuable as food.

References

U. S. Dept. of Agriculture. Bulletin No. 27. "Bouillon Cubes: Their Contents and Food Value Compared with Meat Extracts and Home-made Preparations of Meat."

"Food Products", by H. C. Sherman, 2d ed., p. 238.

Questions

1. Why is bone added to soup? Should it be split into pieces?
2. Would you allow more water to meat in making soup with vegetables than without?
3. Devise ways for utilizing the meat which has been used in soup-making. Why is its use worth while?
4. Why is meat soup more appropriate than a cream-of-vegetable soup for the beginning of a hearty meal?

Home Work

Meat Soup from Left-overs.

As a rule it is poor economy to buy bones for soup, or even meat for soup unless the meat itself is used. On the

other hand, truly delicious soups can be made from the left-over bones from roasts, steaks, and so forth, with the gristly bits of meat which will serve no other purpose. Such soups will need to have other materials added in order to give more substance to the soup; but you can make a very good soup for two or three people from the bone of a T-bone porterhouse steak, for example, by adding some celery tops before you simmer the bone, then straining off the broth and adding to it some tomato juice and a little rice. Let it cook until the rice is done, replacing the water as necessary. Do not season until the soup is done. (Why not before?)

1. Why would the following be an appropriate dinner soup? Try it some day.

Clear Tomato Soup.

- $1\frac{1}{2}$ pts. canned tomato
- 1 pt. water
- 1 slice of onion
- 2 stalks of celery or a handful of celery leaves
- 3 or 4 cloves, or a sprinkling of ground clove
- $\frac{3}{4}$ tsp. salt
- $1\frac{1}{2}$ tsp. sugar if desired

Cook all the ingredients for twenty minutes, then strain, rubbing as much as possible of the pulp through a sieve. Reheat before serving.

If you prefer the soup thickened a little, pour in three tablespoons of flour stirred into a little cold water, and boil the soup for a minute or two when you reheat it.

2. Consult cook books and make lists of herbs and of vegetables which may be used in meat soups.

XXXIX

GELATIN

LEMON JELLY
PINEAPPLE SPONGE
BAVARIAN CREAM
PRUNE JELLY

A. **Class Experiments.** GELATIN.

1. Soak a fourth of a teaspoon of gelatin in a tablespoon of cold water for five minutes. Does it dissolve? What has happened? Add two tablespoons of boiling water. Compare the result of putting two tablespoons of boiling water directly on a quarter of a teaspoon of gelatin that has not been soaked in cold water. Which method will you use in preparing gelatin?
2. Measure the number of tablespoons of gelatin in a box. How much does a tablespoon of gelatin weigh?

How much jelly will it make? See directions with the box.

3. Compare the cost, the net weight, and the amount of jelly supposed to be made from packages of at least three different well-known gelatins.

B. PREPARE THE FOLLOWING GELATIN DISHES.

Place each in a wet mold, put in a cool place to harden. If you wish to use them at once, surround the molds with crushed ice and salt.

To remove jelly from mold, wring a cloth out of warm water and put around the outside of the mold for a minute or two.

LEMON JELLY.

1 envelop of gelatin ($\frac{1}{4}$ oz.)
$\frac{1}{4}$ c. cold water
$\frac{1}{4}$ c. lemon juice
$1\frac{1}{2}$ c. boiling water
$\frac{3}{4}$ c. sugar

Soak gelatin in the cold water until it is absorbed. Pour the boiling water over it, add the other ingredients, stir until dissolved, and strain before molding.

When it begins to stiffen, half of the gelatin, surrounded with ice water, may be beaten with a Dover egg-beater to a stiff froth. When both portions are hard, cut them into cubes and pile them together in the serving dish.

PINEAPPLE SPONGE.

1 tbsp. gelatin
$\frac{1}{2}$ c. cold water
$\frac{1}{4}$ c. sugar
$\frac{3}{4}$ c. pineapple juice
1 c. canned grated pineapple
3 egg whites, beaten stiff

Soak the gelatin in the cold water, add the hot juice and sugar. Strain. When the mixture begins to stiffen, surround it with ice water, and beat it until it is frothy; then add the beaten whites and continue beating until the mixture begins to stiffen again, then put into a mold.

ORANGE BAVARIAN CREAM.

2 tbsp. gelatin
$\frac{1}{2}$ c. cold water
$\frac{1}{2}$ c. boiling water
$\frac{1}{4}$ c. sugar
1 c. orange juice
Grated rind of 1 orange
1 tbsp. lemon juice
$\frac{1}{2}$ pint heavy cream

Make as plain lemon jelly, and when it begins to stiffen, mix in the cream, beaten stiff.

Gelatin

Gelatin for commerce is made from the skin, ligaments, and bones of animals. It is put on the market in a number of forms. Of these, sheet gelatin is possibly the cheapest, but pulverized gelatin is the most convenient.

Value of Gelatin Dishes

As a gelatin jelly usually contains only about two per cent of gelatin, such dishes evidently are not very hearty. For this reason, they make excellent light desserts to use after a substantial meal, or as a hot-weather dish. Since they are also easily digested and absorbed, they are valuable, too, in invalid diets. But, combined with much cream and sugar, a gelatin dish may be made very nutritious.

A word of warning must be given in regard to the use of pineapple and gelatin. This fruit contains a ferment which is capable of liquefying the gelatin, so that if the fruit is used raw, the jelly fails to set. If the pineapple is heated, this ferment is destroyed; so that pineapple jelly may be made with either canned pineapple, or fresh pineapple which has been stewed for a few moments.

In making meat soups, gelatin is formed from the bone and connective tissue which are present in the meat. Since the bones of young animals contain more gelatin-making material than is found in the bones of older animals, while, on the other hand, the meat of older animals has most connective tissue, veal bones are often used with beef in soup-making. Hutchison quotes experiments which show that the buying of bones to obtain

gelatin is much more expensive than adding commercial gelatin to soup, and suggests that the bones themselves should be used only in order to utilize what would otherwise be waste material.

Vegetable Gelatin

Agar-agar, a Japanese seaweed, is sometimes used instead of gelatin, especially by vegetarians. It passes through the body without being digested, and so has no food value. It has the advantage of not being so easily liquefied as gelatin and can be made without ice in warm weather. The vegetable gelatins on the market are usually agar-agar preparations.

Irish moss is another seaweed sold in a dried form. It has a peculiar flavor which is greatly relished by some people. Like agar-agar, it is probably not nutritious. When made into a jelly with milk, it may, however, furish a pleasing variety, and is at least as nourishing as the milk alone.

Questions

1. Compare the cost of a plain fruit gelatin with the cost of the same dish made with a "ready-to-mix" preparation.
2. What advantage have the pulverized gelatins over the sheet form?
3. How many classes of gelatin desserts are there? Consult cook books.
4. What relation is there between gelatin and glue?

Home Work

1. Make Perfection Salad and either mold it in a flat pan and then cut the jelly in squares of such a size that one square is an individual portion, or mold it in individual molds. Serve on a lettuce leaf, preferably with some kind of mayonnaise dressing.

Perfection Salad.

2 tbsp. gelatin	$\frac{1}{2}$ c. sugar
$\frac{1}{2}$ c. cold water	1 tsp. salt
$\frac{1}{2}$ c. vinegar	2 c. celery cut in thin slices
Juice 1 lemon	1 c. chopped cabbage
2 c. boiling water	3 chopped pimentos

Make as lemon jelly, adding the chopped vegetables when the jelly begins to set.

XL

TABLE SERVICE

Dinner

Split Pea Soup
Spanish Cream

Prepare and Serve a Dinner.

Suggested menu:

Soup — Split pea soup.
Meat — Pork chops.
Vegetables —
  Creamed string beans (canned), or
  Creamed turnips.
  Mashed potatoes.
Dessert — Spanish cream.

Split Pea Soup.

Soak a cup of dried peas for an hour or so, then drain, add a quart of cold water and a slice or two of onion, and simmer until the peas are soft. This will take at least two hours. Rub through a strainer, and reheat, thinning with milk until of the consistency of soup. Thicken with flour as in potato soup. A tablespoon of butter will improve the flavor, or a piece of fat salt pork may be simmered with the peas.

Spanish Cream.

1 tbsp. granulated gelatin	Yolks 3 eggs
3 c. milk	½ c. sugar (scant)
Whites 3 eggs	¼ tsp. salt
1 tsp. vanilla	

Scald milk with gelatin, add sugar, pour slowly on yolks of eggs slightly beaten. Return to double boiler and cook until thickened, stirring constantly; remove from range, add salt, flavoring, and whites of eggs beaten stiff. Turn into individual molds, first dipped in cold water, and chill; serve with cream. More gelatin will be required if large molds are used.

From the "Boston Cooking School Cook Book." By Fannie M. Farmer.

Table Service

Most of us do not have waitresses or butlers to serve our meals, but that does not prevent us from having convenient, attractive service. But, for comfort, we must make some use of our heads in planning.

Much more thought must be put into the serving when no maid is present, for continual rising from the table is disturbing to all. A maid can go to the pantry for a forgotten utensil without calling attention to the oversight, but the omission is extremely noticeable if some one must rise from the table. Extra care must be taken, then, to see that the serving has been thought through in detail and that everything which will be needed has been placed near at hand. A wheeled tray or serving table beside the hostess makes it possible to arrange for many things to be within reach without crowding the table. Food must be selected which will not spoil by standing from the beginning of the meal until the appropriate time for serving it.

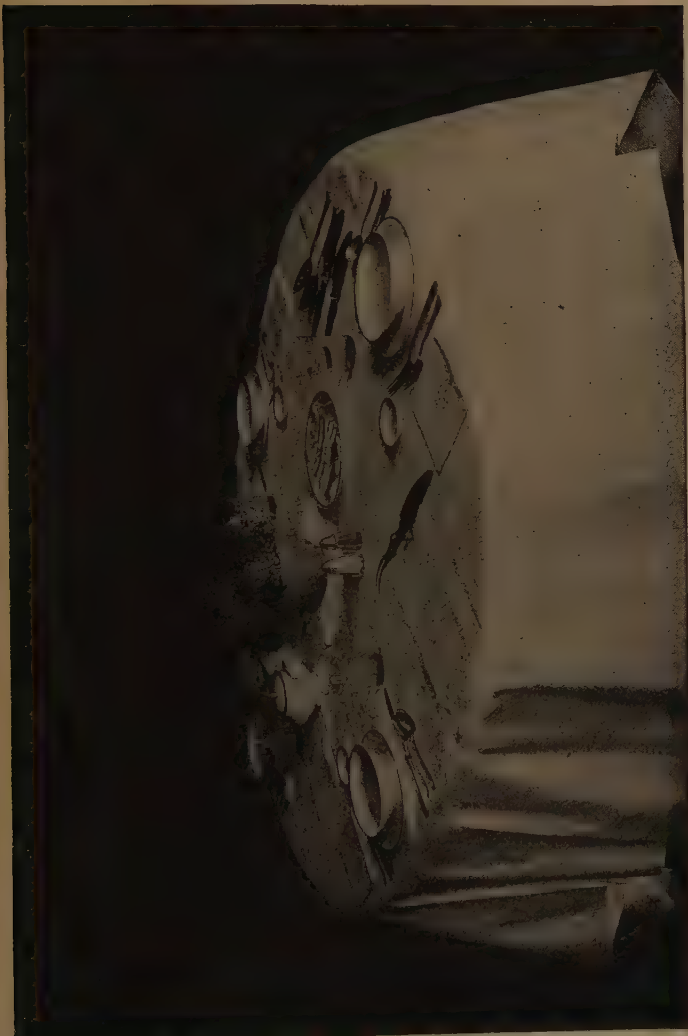


TABLE SET FOR A HOME DINNER

Home Service

Most of us are busy people who do not wish to spend unnecessary time at table waiting for the service of food, but we do appreciate an attractively set table and a table service which runs smoothly. How can we accomplish this? Without a maid, one should not plan for many courses, but most of us like to have soup and dessert served as separate courses. But since three courses take time, many plan to have soup for lunch or supper rather than for dinner, and limit each meal to only two courses.

Some one person or persons should be responsible for waiting on table, preferably some of the young people in the family rather than the father or mother, who are occupied in serving at table, and who, as host and hostess for the family, should be free to stay at table and see that everything goes smoothly there.

The table should be set with the special menu of the meal in mind. One should plan so that all the utensils that will be required are ready, and so that everything is placed where it will be most convenient for the persons who are to distribute the food. When all of the food for the first course is on the table, it should be unnecessary to rise until the course is finished. Just before placing the hot food on the table, fill the glasses, and put on bread and butter if it is to be served. Butter is not always served at dinner.

When the table is cleared for the next course, the serving dishes are carried out first, and then the individual dishes. Do not pile the dishes up before the people at table. To hurry the service, remove the main plate first and, holding it behind the person seated at table, pick up the other dishes in front of him and pile them quietly on the main plate. Next remove salt and pepper shakers,

extra unused table silver, mats or doilies that will not be used for the next course, and so forth. These may be placed on a near-by serving table. Next, if necessary, brush off the crumbs from each place with a folded napkin, catching them on a small tray or empty plate.

Now the dishes and silver needed for serving the next course are brought from the side table and placed on the main table, but all of the utensils needed by each individual are usually put at his place at the beginning. The glasses are filled again, and dessert is brought in.

It is an art to accomplish the clearing of the table successfully, avoiding noise and the piling of dishes, yet with sufficient rapidity.

Formal Service

For formal service with a maid, there are two distinct styles, known as the English and the Russian, and a third style which is a compromise between these two.

English Style

According to the English style, everything is served at the table, — soup from a tureen, meat from a platter placed in front of the host, the dishes being passed either by a maid or by those seated at table. According to the general custom, the hostess serves the soup, salad, and dessert; the host, the meat, fish, and the vegetables to be placed on the plate, while other members of the family serve the butter and such vegetables as are eaten from side dishes. In modern practice the latter are eliminated as far as possible, for only vegetables which cannot be eaten with a fork are served in separate dishes.

Russian Style

In the Russian style, serving dishes are not placed on the table; either the portion of food on a plate is placed before the individual to be served, or the serving dishes are passed in turn to each person and returned to the serving table. The latter is the usual formal style of service and cannot be carried out without a maid. Strict Russian service requires a plate always before each individual except when all are changed for the dessert. The empty plate is removed with one hand as the filled plate is placed with the other hand.

The "Compromise" Style

In common practice these two styles are often combined. Soup, nowadays, is almost always served in the Russian style, whether a maid is present or not. With a maid, the vegetables are frequently served in the Russian style, while the roast is carved on the table and served in the English style. In this case, the maid places an empty plate before the host and, while he is filling it, she takes another plate in her right hand; then, from the left of the host, having taken up the filled plate in her left hand, she puts the empty plate in its place. The filled plate is placed before the individual for whom it is intended, from his right. Then, with another empty plate, the waitress returns to the left of the host for the next filled plate. Dishes from which an individual is to serve himself are, of course, passed to the left, and all serving may be carried on from that side, but the placing of plates and cups from the right is considered the better form. Hot plates and vegetables may be held on a folded napkin; a tray is used for creamer and sugar bowl, or small dishes of jelly and the like, also for silver.

Reference

"Meal Planning and Table Service", by N. Beth Bailey.

Questions

1. Write a note inviting a friend to dinner (*a*) informally, (*b*) formally.
2. Write notes accepting or declining these invitations.
3. What are the duties of a hostess?
4. What are the points to be made in training a waitress concerning her appearance, conduct, and duties?

Home Work

1. Perhaps you are already skilled in waiting on the table at home. If not, see what you can do in the next few weeks to improve your methods of work. Remember that your step should be light and quick when you are waiting on table, and you should avoid any more walking around than is absolutely necessary.

2. Prune Jelly is a simple dessert to make, but a very delicious one. Try it sometime.

Prune Jelly.

½ lb. prunes	1 c. sugar
2½ tbsp. gelatin	¼ c. lemon juice
½ c. cold water	

Wash and soak the prunes, in enough cold water to cover them, for several hours before cooking. Stew them until they are soft, then remove the stones and cut the prunes in pieces. Add enough boiling water to the prune juice to make two cups. Soak the gelatin in the cold water, and pour over it the hot prune water; add the lemon and sugar and strain; then add the prunes and put in a mold. The jelly should be served with cream and sugar.

XLI

POULTRY

Roast Chicken — Fried Chicken
Stewed Rabbit

A. **Class Work.** Chicken.

1. Weigh a chicken. Compare with weight after it is cleaned and dressed, but not stuffed.
2. Clean and dress a chicken and truss as for roasting. If the head and feet have not been removed, cut them off. Remove pin feathers, using a small knife and being careful not to break the skin. Turn back the skin at the neck so as to cut off the neck close to the body, and pull out the windpipe and the crop. Starting just below the breastbone, make a lengthwise incision just large enough to admit the hand and remove the entrails, gently, so as not to break the gall bladder. Save the gizzard, heart, and liver, but discard the gall bladder. Remove the lungs and the kidneys, saving the latter. With a knife remove the oil bag from the tail. Singe the chicken over a flame, and wash it inside and out. With a knife slit the gizzard all around to the inner lining and pull off the flesh. Trim the heart. The neck and giblets are

simmered, and the broth with the meat finely chopped is used in making gravy.

To truss fowl:

Draw thighs close to body and hold by inserting a steel skewer under middle joint, running it through the body, coming out under middle joint on other side. Cut piece three-fourths inch wide from neck skin, and with it fasten legs together at ends; or cross drumsticks, tie securely with a long string and fasten to tail. Place the wings close to the body and hold them by inserting a second skewer through the wing, body, and wing on opposite side. Draw the neck-skin under back and fasten with a small wooden skewer. Turn bird on its breast. Cross string attached to tail piece and draw it around each end of lower skewer; again cross string and draw around each end of upper skewer; fasten string in a knot and cut off ends. In birds that are not stuffed, legs are often passed through incisions cut in body under bones near tail.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

3. Instead of roasting the chicken, cut it up and prepare as fried chicken.

If the chicken is tender, sprinkle the pieces with flour and salt and sauté them in hot fat in a frying pan. When brown, lower the heat, cover, and cook slowly for a few moments. If meat is tough, parboil until tender, then sauté, as before, until brown. In this case, the broth is used to make the gravy, and the flour is browned; in the first way, milk is used as the liquid and the flour is not browned. In either case, use the fat in which the chicken has been cooked.

Poultry

While in its broader sense the term meat includes the flesh of all animals, in its narrow sense it includes only beef, veal, mutton, lamb, and pork. These are sometimes spoken of as "butcher's meat." Poultry is the name given to all domestic birds suitable for food. Pigeon and squab, together with all birds and animals which are hunted, are known as game.

Selecting Poultry at Market

With modern methods of cold storage and incubator hatching, there is no longer much need of considering season in connection with chicken. It is always found in market. Young chickens weighing about a pound and a half are often called broilers. In selecting chicken, it is necessary to know the signs of age. The chicken is known by its smooth feet and skin, and abundance of pin feathers, and the soft cartilage at the end of the breastbone. Long hairs and hard, scaly feet are signs of an older bird. A good turkey is plump, with smooth, dark legs, and also shows soft cartilage at the end of the breastbone. Young geese, like young chickens, have an abundance of pin feathers.

The United States Department of Agriculture recommends that poultry be shipped without the removal of the entrails. In order to ship for long distances, poultry, after killing, must be kept in a temperature of about 32° F. While below 30° F. the flesh becomes "frosted", at 35° F. it deteriorates too rapidly for good results. It is customary to thaw frozen poultry before it is sold. This gives opportunity for deterioration to take place, and it would be much better if customers would demand such poultry still frozen.

The Digestibility of Meat

The fibers in the meat of chicken and turkey are shorter than in beef and mutton. This makes them tender. The white meat of chicken is especially tender on account of the tender fibers and the small amount of connective tissue.

Ease, Quickness, and Thoroughness of Digestion

There is probably little difference in the comparative digestibility of different kinds of meat. Many books quote experiments which have determined the length of time meat remains in the stomach. Undoubtedly this time is affected by the toughness, the method of cooking, the amount of fat present, and the degree to which it has been ground up by the teeth, as well as by the kind of meat eaten. It is well proved that much fat means that the meat stays a longer time in the stomach.

Tables have been made from these results, in regard to ease and lack of discomfort in digestion, which agree pretty well with popular opinions. In general, the rarer the meat and the less fat present, the more quickly it passes from the stomach. But as the digestion of meat is also carried on in the intestines, this is only part of the story. It has been shown, however, that differences in digestibility are not at all marked if determined by the test of the total amount which is digested and absorbed. Thus meat ranks with milk and eggs, being from ninety-seven to ninety-eight per cent digested and absorbed. As protein in general is not more than ninety-five per cent digested and absorbed, meat must be ranked as a food that is well utilized and fairly rapidly digested.

Question of Extractives

Opinions differ as to whether there is any essential difference in the amount and kinds of extractives present in "light" and "dark", or in "red" meat. That there are slight differences is indicated by the distinctive flavors of the different kinds, but that these are sufficient to warrant the allowing of some and the exclusion of others from the diet under different circumstances, seems hardly warranted.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 467. "Food Value and Use of Poultry."

Questions

1. From what three standpoints may we consider "digestibility"?
2. When people say a food is "indigestible", what do they generally mean?
3. In what senses is meat digestible?
4. Review the principles of meat cookery and discuss good methods of preparing a tough chicken for the table.

Home Work

1. What kinds of game are found in your local market? When?
2. Is game brought into market usually cheap? Is rabbit?
3. Give a table showing seasons when chicken, fowl, turkey, geese, and ducks are best, and give price per pound.
4. Rabbit in season is usually cheap, and when well-prepared is delicious.

Rabbit Stew.

Use two rabbits, skinned and cleaned, disjointing them into pieces of the right size for serving. Wash, drain but do not wipe, sprinkle with salt and roll in flour, then put the pieces in an iron frying pan with two or three tablespoons of hot bacon fat or lard, and sauté until each piece is browned (turn each as necessary). Now pour hot water into the pan until it is about an inch deep; cover closely and let the meat simmer until it is tender — for at least an hour. Remove the meat to a hot platter, and thicken the gravy by adding flour stirred in cold water, using the proportion of flour that you need for making a medium white sauce. Season it to taste and pour over the pieces of meat.

XLII

THE DINING ROOM

Dinner

FRIED FISH
CHOCOLATE BREAD PUDDING

PREPARE AND SERVE A DINNER.

Suggested menu:

Meat — Sautéed Fish
Vegetables — Buttered beets
Baked potatoes
Salad — Lettuce with French dressing
Dessert — Chocolate Bread Pudding with cream and sugar

SAUTÉED FISH.

Sauté any small, fresh fish, or slices of cod, halibut, and so forth. Wipe the fish with a damp cloth, sprinkle with salt and roll in a mixture of corn meal and flour, and brown it in a frying pan greased with fat.

CHOCOLATE BREAD PUDDING

2 sq. chocolate	$\frac{1}{2}$ c. sugar
1 qt. milk (or milk and water) scalded	$\frac{1}{2}$ tsp. salt
2 c. bread crumbs	1 egg, beaten

1 tsp. vanilla

Melt the chocolate over water, stir in the scalded milk slowly, and then add the other ingredients. Pour into a greased baking pan and bake until firm — about half an hour. Serve warm.

The Dining Room

The American woman has been accused in the past of great lack of taste in the furnishing and decoration of her house, although being second only to the French woman in her knowledge of how to dress. Fortunately, however, matters have been improving greatly in this respect, perhaps because the woman is beginning to understand that, while fashion complicates the problem, there really are fundamental laws to guide her. Honesty, simplicity, and use are the touchstones, and it is amusing that it is the artists, who have always been considered impractical in matters of everyday life, who are insisting that usefulness is the first test.

Some Art Principles

First, a thing should look like the thing it really is and not like something else. A salt shaker should look like a salt shaker and not be an owl with holes in its head. A pillow on a couch should be made to be a pillow, not ruffled or beaded, nor of some material which would either be easily spoiled or uncomfortable to use. Suitability, also, is being considered. The era of hanging gilded rolling pins with hooks across them for key holders, or gilded toasters for magazine racks, has gone by. But man is still under the influence of the notion that we must have multitudes of things around us. Let us rather test every object in a room and decide if it is really useful or if it is really beautiful, and discard the rest. Let each object be as beautiful as possible. The use of

ornament is shown everywhere about us, but much of the so-called ornament is meaningless, interferes with use, or greatly increases work. This is unsuitability.

Suggestions for Choice of Furniture

With this in mind it is easy to formulate the needs of the dining room. First, it must be a place not only really clean, but one that allows no suspicion in the matter. A well-lighted room with light colors is required rather than a dark one which might conceal dirt. Few objects should be around. Too many suggest subconsciously to the mind that since it is much work to dust, dust has probably been allowed to accumulate. The air must be fresh; no stale odors of food are welcome. Therefore, heavy materials to which odors cling are unsuitable for draperies or upholstering. Carpets are excluded, and rugs are admitted only because they deaden noise. Moreover, as one likes to be sure nothing has been spilled on the chair, evidently leather or cane seating is to be chosen instead of stuffed furniture. The height of table and chairs should be carefully adjusted for comfort. Chairs that are so high that the average person cannot touch the floor while sitting in them are disagreeable. Again, children often are seated at table so that their chins barely appear, or they are placed so high that they are sitting almost on a level with the table itself, and are then reproved for spilling.

Since undoubtedly our state of mind affects our digestions, colors must be restful and harmonious, and the room must be light and cheerful. On the sideboard or table may be placed utensils which are appropriate and beautiful. But remember that it is almost impossible to have too few articles around, for things accumulate almost

AN ATTRACTIVE DINING ROOM

faster than they can be cared for; and that it is, consequently, very, very easy to have too many.

Reference

"Meal Planning and Table Service", by N. Beth Bailey, Chap. II.

Questions

1. Calculate the cost per person of the dinner served and compare it with the following dinner:

    Main course — Fish chowder
    Tomato Salad
    Bread and butter
    Dessert — German toast with a pudding sauce

2. Describe a dining room which you consider suitably furnished.
3. How would you rank a dining room, as a public, semi-public, or private room? What influence should this have on the choice of pictures for the room?

Home Work

1. Make a list of dishes, glass, silver, linen, and the like, which you would consider a moderate equipment for a dining room, and find out about what the cost would be.

XLIII

FISH

Baked Fish
Boiled Fish with Egg Sauce
Scalloped Fish with Stewed Tomato

A. **Class Work.** Prepare Baked Fish.

Baked Haddock with Stuffing.

Clean a four-pound haddock, sprinkle with salt inside and out, stuff, and sew. Cut five diagonal gashes on each side of backbone and insert narrow strips of fat salt pork, having gashes on one side come between gashes on other side. Shape with skewers in form of letter S, and fasten skewers with small twine. Place on greased fish-sheet in a dripping-pan, sprinkle with salt and pepper, brush over with melted butter, dredge with flour, and place around fish small pieces of fat salt pork. Bake one hour in hot oven, basting as soon as fat is tried out, and continue basting every ten minutes.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

B. The Effect of Different Ways of "Boiling" Fish.

Notice in which ways the fish is toughest, and in which it is tender, but keeps its shape. What is the

advantage of the cheesecloth? Formulate a rule for so called "boiled" fish.

1. Place a small piece of fish (haddock or halibut cut in inch cubes) in a cup of boiling water, and boil rapidly for ten minutes.
2. Place a second piece of fish in a cup of boiling water, and simmer for ten minutes.
3. Repeat (2), but first wrap the fish in cheesecloth.
4. Repeat (2), but before putting in the fish add three-quarters of a teaspoon of vinegar or lemon and a quarter of a teaspoon of salt.

Serve half the fish with egg sauce. This is a medium white sauce made with water as the liquid, twice the usual amount of butter, and hard-cooked egg, either sliced or chopped. The sauce without the egg is known as drawn butter.

Scallop the rest of the fish. Soft bread crumbs may be added to the fish to increase the amount. Serve with stewed tomato.

Fish

Composition of Fish

The composition of fish is not unlike that of meat. In general, it is considered to be a somewhat lighter and less nourishing food than meat. Here is a comparison of the composition of two typical fish with beef.

	Round Beef *very lean*	Cod Steak *edible portion*
Protein	22.6	18.7
Fat	2.8	0.5
Ash	1.3	1.2
Water	73.6	79.7

	Round Beef *all analyses*	Mackerel *edible portion*
Protein	20.9	18.7
Fat	10.6	7.1
Ash	1.1	1.2
Water	67.8	73.4

As fish contains less extractives and rather less protein also, it can well be substituted for meat in the dietaries of people who take little exercise. Sea fish is also of value for the iodine it contains.

Fish may be divided into groups according to the amount of fat the flesh contains, cod and whitefish being examples of lean fish, while salmon, mackerel, and bluefish are oily.

Selection of Fresh Fish

Fish spoils so readily that it is even more important to know how to select it than how to select meat. It is true that the flavor of fish is much better if it can be used as soon as caught. Since this is not possible with fish sold in market, such fish should be killed as soon as caught, and kept on ice. Notice that, in the market, fish exposed for sale is sprinkled with chopped ice. To be good, the flesh must be firm, not soft and flabby, and eyes and gills must be bright. With practice, the sense of smell is a great aid in determining freshness.

The amount of waste in head, bones, and skin is large, if fish are bought whole. Hutchison estimates that this may amount to seventy per cent as purchased, and even be as much as thirty-five per cent in fish as sent to the table. These facts must be taken into account in determining the actual cost of fish, as well as the real cost of

canned fish free from waste. As usual with foods, the cost is no measure of the food value of the special kinds of fish bought. The fat fish are much more nutritious than lean fish on account of the fat which is present.

If fish have been cleaned at market, they should still be wiped inside and out with a damp cloth. Great care must be taken of fish after it has been bought. It should be kept cold, on ice if possible, but, unless the flesh is protected by skin, not directly on the ice itself. It must not stand long before being cooked.

The distinctive taste of fish is due partly to the fat present. Since the flavor — except in very oily varieties — is never strong, even greater care should be taken in cooking to preserve the extractives in fish than in meat. At least five per cent of the solid matter in fish may be lost in boiling. Acid, lemon juice, or vinegar, is often added to the water used in boiling fish in order to help coagulate the protein, and so keep the flesh white and firm.

In general, fish is about as digestible as meat, the kinds containing less fat digesting with greater ease than the more oily varieties. Salt, smoked, and pickled fish are all more difficult of digestion than fresh fish.

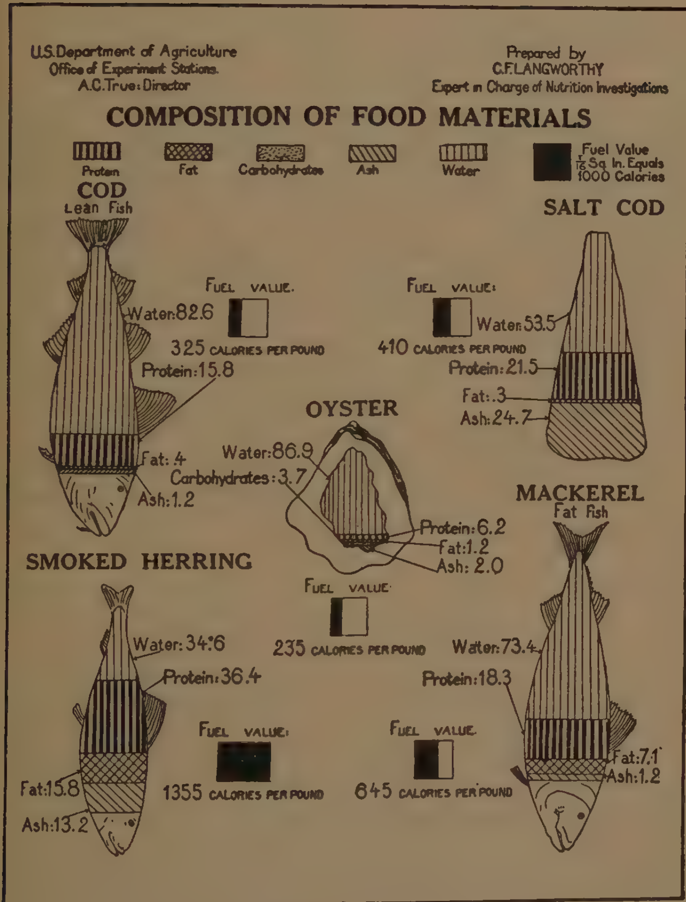
Reference

U. S. Dept. of Commerce, Bureau of Fisheries. Econ. Circ. 29. "Why and How to Use Salt and Smoked Fish."

"Boston Cooking-School Cook Book", by Fannie M. Farmer, Chap. XI.

Questions

1. What is the place of fish in the diet?
2. Is it worth while to learn to eat fish?
3. How should a fish be cleaned? Scaled? Skinned?
4. In boiling a large piece of fish, why would it be convenient to put the fish on a plate or rack, and wrap them up together?



Composition of Fish and Oysters

Would strips of cheesecloth placed across under a fish to be baked help in lifting it when done?

5. Why is pork or butter usually added in baking fish, but not in baking meat?

Home Work

1. Make a list of fish which would be classed as rich and oily, and of those which could be called dry. Which class usually has dark flesh? Which are considered more easily digested?

Consult cook books for sauces and garnishes suitable to serve with fish, and list those which seem practical for you. Suggest also combinations of vegetables which are good with fish. Finally suggest ways of using left-over fish.

2. Find out what kinds of fish are commonly sold in your home market. Make a table showing season and price. Suggest suitable ways for cooking these fish.

3. Here are two good ways of using salt codfish. Try them. Be careful to flake the codfish into thin shreds or it will be tough.

Creamed Codfish.

¾ c. shredded salt codfish	1 c. milk
2 tbsp. butter	1 egg, beaten
2 tbsp. flour	Salt as needed

Shred the codfish in thin pieces (this is most easily accomplished by the use of two three-tined forks), and soak it in lukewarm water until it is soft. The time necessary varies from an hour to over night, depending upon the saltness and dryness of the fish. Make a white sauce with the other ingredients and drain and add the salt fish, cooking it only long enough to heat it for serving; then stir in the beaten egg, taste, and add salt as necessary.

Quick Supper or Luncheon Dish.

1½ c. salt codfish
1 c. rice
2 tbsp. chopped green pepper
1 small onion
2 tbsp. melted butter
½ c. tomato

Flake and soak the fish as directed in the previous recipe. Boil the rice until it is soft. Drain both the fish and the rice and mix them together, then add the other ingredients and let the whole simmer for half an hour. In using green peppers, remove the seeds, which are very hot, then cut or chop the pepper itself.

XLIV

OYSTER STEW — FISH CHOWDER

A. **Class Experiments.** COOKING OYSTERS.

Put an oyster in water and heat slowly to boiling. Observe all the changes which take place, and the temperatures which cause the changes. When are oysters done? What is the best temperature to use in cooking?

B. PREPARE OYSTER STEW.

1 pt. oysters	2 tbsp. butter
1 qt. milk	½ tbsp. salt

Pepper if desired

Clean oysters by pouring a little cold water over them in a strainer. Add this water to the oyster liquor and strain through cheesecloth to remove any sand present. Feel each oyster to be sure no bits of shell remain. Season hot milk with salt, pepper, and butter, then add oyster liquor and oysters. How long will you cook it after the oysters are added? If thick stew is preferred, rolled crackers are sometimes cooked in the milk, or the whole thickened with flour.

C. PREPARE FISH CHOWDER.

4 lb. cod or haddock (or other non-oily fish)	1 tbsp. salt
6 c. potatoes cut in ¼ inch slices or	⅛ tsp. pepper
4 c. potatoes cut in ¾ inch cubes	3 tbsp. butter
1 sliced onion	4 c. scalded milk
1½ inch cube fat salt pork	8 common crackers

Order the fish skinned, but head and tail left on. Cut off head and tail and remove fish from backbone. Cut fish in two-inch pieces and set aside. Put head, tail, and backbone broken in pieces, in stewpan; add two cups cold water and bring slowly to boiling point; cook twenty minutes. Cut salt pork in small pieces and try out, add onion, and fry five minutes; strain into stewpan. Parboil potatoes five minutes in boiling water to cover; drain, and add potatoes to fat; then add two cups boiling water and cook five minutes. Add liquor drained from bones, then add the fish; cover, and simmer ten minutes. Add milk, salt, pepper, butter, and crackers split and soaked in enough cold milk to moisten. Pilot bread is sometimes used in place of common crackers.

From the "Boston Cooking-School Cook Book." By Fannie M. Farmer.

Oysters

Oysters, the United States Deputy Commissioner of Fisheries tells us, are not only the most extensively eaten of all shellfish, but are also, with a single exception, the most valuable economically of all aquatic animals. The United States furnishes eighty-eight per cent of the total quantity of oysters produced, and has at least 150,000 men and women engaged in the industry. While all of the coast states but one deal in oysters, in fifteen of them this is the chief fishery product. However, the greatest number of oysters in this country come from Long Island Sound, Maryland, Virginia, Mississippi, Louisiana, Texas, and Washington. France produces the crop next largest to the United States. Japan and China are also oyster-producing states.

Digestibility and Composition

It is easy to see what a demand there must be for oysters. This is no doubt partly due to the fact that they are easily digested, but it is probably also because they can be used to furnish considerable variety to the diet, since they lend themselves to so many ways of preparation. They are almost universally used, appearing on the menus of the most exclusive as well as the cheapest restaurants.

Langworthy gives the following composition for oysters:

Water	88.3 per cent
Nitrogenous substances	6.1 per cent
Fat	1.4 per cent
Carbohydrates	3.3 per cent
Salts	1.9 per cent

The total solids are about equal in amount to those of milk, but a quart of shucked oysters costs from four to five times as much as a quart of milk. Oysters, like milk, are bulky for the amount of nourishment which they contain. The nitrogen present is probably not all in the form of protein; the carbohydrate is largely the glycogen stored in the liver of the animal. Milk and oysters are the two animal foods which are exceptional in furnishing large amounts of carbohydrate, although not in the same form. Eaten raw, oysters are an unusually digestible food; even cooked, they are still easily digested, although they are less so when fried than when cooked in any other way.

The Oyster Industry

Long ago the demand for oysters outran the natural supply and oyster culture became an industry. Italy began their cultivation about a hundred years before the Christian era, and within the last century even those

places where oysters were naturally most abundant have been forced to cultivate them. In order to understand what oyster farming means one must know something of the habits of the oyster. An oyster produces an incredible number of eggs, apparently to compensate for the fact that in natural life the percentage of those that will find suitable conditions for development is very small. Oyster farming consists in the preservation of as many of these eggs as possible. The newly-born young is not more than one one-hundred-and-fiftieth of an inch long, nearly transparent, has no shell, and swims freely. By the time it is large enough to be visible to the naked eye it can no longer move around. To survive during the swimming period it must not only escape being eaten by adult oysters, fish, and other shellfish, but it must find a suitable place in which to develop. If it sinks on a muddy, soft, sandy, or slimy bottom it cannot live. If, however, it attaches itself to clean shells it has a chance to survive. But the oyster has many enemies against which even the hard shell that surrounds it does not afford perfect protection. Certain mollusks drill minute holes through the shell and so get at the oyster's body, starfish may force the shell open and devour the contents, or it may be attacked by certain kinds of fish with jaws powerful enough to crush the shells; or barnacles, sponges, or mussels may grow so thickly on the shell as to cut off food and oxygen. Oyster culture consists mainly in providing suitable beds of shells for the young oysters and in protecting them from as many of their enemies as possible. Palisades are sometimes erected around the beds to keep off the large fish.

Marketing Oysters

When ready for market the oysters are dredged, freed from dirt and attached shells, and sorted according to size.

Three sizes are usually recognized. The smallest, called "half shells", are usually eaten raw, the middle-sized, sometimes called "culls", are for general use, while the largest or "box" oysters are selected for frying. The difference in size is mainly a question of age, for, while there are many varieties of oysters, there is not much variation in size between the varieties. One peculiarity of the oyster is that it remains just as tender when old as it was when young. The fact that it takes no exercise may explain this. The names Blue Point, Rockaway, and the like, which used to indicate the locality from which the oyster came, now usually mean no more than size. For example, many small oysters are called Blue Points.

Oysters stand shipping well. If left in the shell, kept cool, and sprinkled occasionally with brackish water, they will live for weeks without any deterioration. Even when "shucked", if kept cool, they remain edible for eight to ten days, but they keep best if removed from the oyster liquor. Shucked oysters are usually washed carefully in a number of waters, and packed in air-tight receptacles surrounded by ice. Care must be taken not to let them become frozen. Formerly, they were shipped floated in a tub with a cake of ice. The objections to this practice were twofold. The ice often had to be replaced during the shipping, with the consequent danger of infection. Secondly, oysters lose salts and much flavor if soaked in fresh water, although they gain in size from the absorption of water. Consequently many States require the other method of shipment and specify that the oysters sold shall not contain more than ninety per cent water. Because they take up fresh water, oysters are sometimes "fattened" by placing them in the fresh water at the mouth of rivers. It is most necessary that such beds shall not be in water contaminated by sewage, lest the raw

oyster become a carrier of typhoid germs, but, even at best, there seems to be no reason for allowing the practice.

The notion that oysters cannot be eaten during the months which contain no "r" in their names, May, June, July, and August, has no real foundation except that they are more likely to be contaminated by the bacteria in the water when it is warm. Oysters are not good when they are spawning, but this requires only from three to four weeks and takes place in different species at different seasons. Of course, if not kept properly cool, oysters spoil more quickly in hot than in cold weather.

Oysters occasionally appear unusually green. This is sometimes due merely to certain seaweeds or diatoms on which they have been feeding, and does not in any way impair the oyster as an edible product. Only rarely is it due to copper, and probably never in amounts sufficient to prove injurious.

References

U. S. Dept. of Commerce, Bureau of Fisheries, Econ. Circ. No. 18. "Oysters: A Little of Their History and How to Cook Them."

National Geographic Magazine, Vol. 24 (1913), pp. 257–281.

Smith. "Oysters; the World's Most Valuable Water Crop."

Questions

1. Compare the cost, fuel value, and composition of oyster stew and a cream vegetable soup.
2. Compare the cost of the same amount of protein from fish, shellfish, and beef.
3. Should the crabs frequently found in oysters be used?
4. Are oysters which are greenish good to eat?
5. In what months are oysters not used, and why?

Home Work

1. Compare the cost and taste of a fish chowder made at home with a canned chowder of good brand.

If fresh lobsters and clams are obtainable in your market, compare the cost of these with oysters. If not, compare the cost of canned lobsters and clams.

Are shellfish expensive forms of nutriment?

2. If practicable, prepare scalloped oysters.

Scalloped Oysters.

1 pt. oysters	½ c. butter, melted
¼ c. oyster liquor and water	½ tsp. salt
3 c. soft bread crumbs	Paprika or pepper

Clean the oysters and strain the liquor as directed for oyster stew. Stir the crumbs into the melted butter and spread about a quarter of them over the bottom of a buttered baking dish; then put half of the oysters in a layer on top of the crumbs, and sprinkle them with half of the salt and a little paprika. Next cover the oysters with another layer of crumbs — use about another quarter of them — and pour half of the oyster liquid on the crumbs. Now make a second layer of the remaining oysters, add the rest of the seasoning, another quarter of crumbs, and the rest of the liquor. Finally put the rest of the crumbs on top, and bake in a moderate oven for thirty minutes to thirty-five minutes.

XLV

MEAT SUBSTITUTES

CHEESE AND BEAN LOAF
MEATLESS STEW
STUFFED PEPPERS
SMOTHERED EGGS

A. MEAT-SUBSTITUTE DISHES.

Each student should come to class prepared to suggest good meat-substitute dishes.

B. PREPARE THE FOLLOWING:

CHEESE AND BEAN LOAF.

1 pt. cooked or canned kidney beans	Bread crumbs
½ lb. American cheese	2 tbsp. fat and 2 or 3 of water

Grate the cheese and mix with the beans, mashing the latter. Add enough bread crumbs so that you can shape the mixture in a roll. Put in a greased baking pan and bake, basting with the fat and water.

Serve with tomato sauce made like medium white sauce, using strained tomato juice for the liquid.

Meatless Stew.

1 onion, sliced crosswise	4 potatoes	Pared and diced
2 tbsp. fat	4 carrots	
$1\frac{1}{2}$ tsp. salt	3 turnips	

Brown the onion in the fat in an iron frying pan. Bacon fat, salt pork, or tried-out beef fat are excellent to use for this purpose. Add the salt and vegetables and cover the mixture with water. Cover the pan and let the vegetables cook until they are tender — about thirty to forty minutes. Thicken by adding a tablespoon of flour stirred in cold water for each cup of the liquid. Season to taste.

Stuffed Peppers.

6 green peppers	3 tbsp. grated cheese
2 c. soft bread crumbs	2 tbsp. melted butter
$\frac{3}{4}$ c. finely chopped celery	1 tsp. salt
$\frac{1}{4}$ c. water	

Cut a slice from the stem end of the peppers, then cut them in halves lengthwise, remove the seeds, and boil the peppers for fifteen minutes. Mix the other ingredients, adding enough cold water to moisten the crumbs slightly. Stuff the halves with the mixture and bake for about ten minutes until the crumbs begin to brown.

Substitutes for Meat

As a general thing meat once a day is considered a normal amount for the average adult. Of course, it is entirely possible to eat in three meals, if we have meat at each, the same amount of meat that is eaten at the one meat meal, but usually we are tempted to eat more if we have it oftener. On the other hand, it is not at all necessary for a person to have meat even as often as once a day,

provided that sufficient combinations of protein are provided in the other food. To many, going without meat at a meal is understood to mean no change at all in the meal except for the omission of meat. But to make the meal satisfying something else must be provided to take its place. This should be what is known as a hearty dish — one that "stays by" you, and one with sufficient flavor. It need not necessarily always be protein or even largely protein unless meat is seldom or never used. If no meat at all is eaten, there should be large amounts of milk and eggs or nuts in the diet. Eggs themselves make a good substitute for meat and are often cheaper, but nuts are usually expensive and, unless finely ground or thoroughly chewed, they are likely to be indigestible.

Use of Fish

Fish is frequently spoken of as a substitute, but should really be counted rather as meat itself. It is, as a usual thing, not much cheaper than meat and may even be more expensive. In some places, however, fish costs less than meat, especially if the cheaper varieties are bought.

Peas and Beans

Peas and beans are both relatively high in protein. Bought dry, they are inexpensive food even when the fuel necessary to cook them is counted. All of the following may usually be bought dry: white, lima, navy, kidney, and black beans, lentils, white, yellow, green, or black-eyed peas. One pound of any of these is more nutritious than a pound of meat, for they contain as much if not more protein than meat, as well as some carbohydrate and fat. We must remember, however, that the protein in these peas and beans is not efficient unless supplemented. Soy beans, however, do contain complete protein.

Cheese

Cheese is another nutritious food and a very cheap one when compared to meat. An inch cube of American cheese is more than equal to the fuel value of an egg, or to an ounce of porterhouse or sirloin steak, and supplies as much protein even as the latter. To put it another way, one pound of cheese is equal in fuel value to almost two pounds of meat, supplies almost as much protein, and, as a rule, costs less than half as much.

Cutting Down the Use of Meat

Another way to cut down our meat consumption is to serve the meat mixed with cereals or vegetables. Almost all the suggestions of ways for using left-over meats in Section XXXVI tend to lessen the actual amounts of meat eaten.

Most people who are used to eating a great deal of meat declare that they are hungry if they try to do with less. They fail to realize that this is always the result of any sudden change in diet. Even when some men who had been vegetarians all their lives were induced to begin eating meat, their complaint was that it was not satisfying and they felt hungry. Consequently, all changes in diet should be made slowly. If you have been eating meat three times a day, don't expect to feel satisfied if you suddenly cut down your meat meals to one or two a week.

Questions

1. Explain why one may wish to serve meat-substitute dishes.
2. What foods are real substitutes for meat in that they supply complete proteins?
3. In what needed elements are meats lacking?
4. Plan a series of meals for a week, using meat only once in that time. Be sure you include enough protein.

Home Work

Prepare some meat-substitute dishes at home. Here is one such dish to try:

Smothered Eggs.

3 c. hot cooked hominy or rice	3 c. medium white sauce
6 eggs	½ lb. cheese, grated or cut into small pieces

Put the cereal into a buttered casserole or baking dish and make six depressions in the cereal layer. Open the eggs into a cup, taking care not to break the yolks, and pour one into each hole. Bake from ten to fifteen minutes, just until the eggs are firm. Make the white sauce, stirring in the cheese just before serving. Pour the sauce over the eggs and cereal.

XLVI

FREEZING

Lemon Ice and Sherbet
Lemon Milk Sherbet

A. **Class Experiments.** A Study of Freezing Mixtures.

1. Prepare a quart bowl nearly full of:
   a. cracked ice.
   b. mixture of one part of salt to one part of ice.
   c. mixture of one part of salt to seven parts of ice.

   Insert a thermometer in each bowl as soon as the ice and salt are mixed and find the lowest temperature obtainable in each case, also the length of time necessary to obtain this temperature.
2. Effect of different freezing mixtures.
   Prepare a syrup, using four tablespoons of sugar to three-fourths of a cup of water. Pour a quarter of a cup of the syrup into three tin measuring cups (or small baking-powder cans). Prepare bowls as in (1) and insert one of the cups in each, and stir until frozen. Compare the time required to freeze, and the textures of the frozen syrups. Which freezing mixture will you use to freeze an ice or a sherbet?

3. Insert in a freezing mixture of one part of salt to seven parts of ice test tubes containing:
   a. a tablespoon of water.
   b. a tablespoon of water and a saltspoon of ground spice.
   c. a tablespoon of syrup (one part sugar to four parts of water).
   d. a tablespoon of syrup (one part sugar to one part of water.

   Notice the time necessary to freeze and the texture of each. Take the temperature of each when frozen. What is the effect of suspended and dissolved substances on the freezing point of water?

B. PREPARE LEMON ICE OR SHERBET.

Decide how many people you wish to serve and allow half a cup of water, three tablespoons of sugar, and one tablespoon of lemon juice for each person.

FOR LEMON ICE.

Boil the sugar and water together and add the lemon juice; cool, and pour into the inside can of the freezer. What proportion of ice and salt will you use to freeze this?

FOR LEMON SHERBET.

1. If you wish to use gelatin to thicken the sherbet, allow two teaspoons of gelatin for each quart of liquid. Soak the gelatin in a little cold water while the syrup is cooking. Then pour the hot syrup over the gelatin, add the lemon juice, and strain the mixture. Grated lemon peel may be added.
   Or, if you wish to use egg white for the thickening:

2. When syrup is cool, mix in stiffly beaten white of egg, using one-half to one egg white for each cup of liquid. Add lemon as before.

Freezing Mixtures

Without a knowledge of physics it is rather difficult to understand how ice and salt act as a freezing mixture. In order to understand it at all we must know some preliminary facts.

In the first place the subject of energy must be considered.

Changing One Kind of Energy into Another Kind

By energy we mean power to do work. Cold is not a thing in itself, but merely the absence of heat. Heat, light, electricity, magnetism, and motion are all forms of energy and can be transformed one into another. Electricity in our lamps, for example, is changed into light and also gives off heat. In an electric flat-iron, heat is produced without light at all. The heat of the fuel is, in a locomotive, turned into the motion which carries the train along. It is well known, too, that some substances, as a piece of hard rubber such as is found in a fountain pen, can easily be electrified on a cold day by rubbing briskly on a woollen surface and that they will then attract bits of paper.

In all these cases one kind of energy is merely changed into another kind, for it is a law in physics that no energy is ever destroyed, but continues to exist. When a solid like ice is changed into a liquid like water, or a liquid such as water is changed into a gas such as water vapor, heat is necessary for the change. The heat is said to be used up in this work and is spoken of as hidden, or latent heat.

The same kind of action is illustrated by boiling water. The temperature of the water rises until the boiling point is reached, but no further application of heat will raise the temperature above this point. This is because as fast as the heat is supplied it is used up in turning the water into steam; the more the heat supplied, the more steam there is formed, but the temperature of the steam itself is the same as that of the water from which it comes. But when we say that the heat is used up, we do not mean that it is destroyed; for if the vapor be changed back to water, or the water to ice, the energy again manifests itself and appears as heat.

Substances in Solution Lower the Freezing Point

A second point to be understood is what is shown by the freezing experiments: a liquid that has another substance dissolved in it no longer freezes at the same temperature, but at a lower one. The more substance there is dissolved, the lower the freezing point becomes.

Why Salt and Ice Act as a Freezing Mixture

Now what happens when the ice and salt are mixed that makes the two so much colder than before? The ice is at 32° F. and the salt much warmer, but as soon as they are mixed the temperature falls rapidly. What occurs is this. The ice and salt which are next each other are mixed to form brine. But brine, being really water with salt dissolved in it, should not freeze at 32° but at a much lower temperature. If it cannot be frozen, the ice must melt. But, as has already been said, heat is necessary to bring this about. The only available heat is in the mixture itself or the surrounding objects with which it comes into contact. This heat is used up in doing the work of melting

the ice and becomes latent, — that is, disappears and is no longer evident as heat. Some heat also is used in doing the work of dissolving the salt in the water. As a result of these two actions the temperature of the mixture drops.

Ice-cream Freezers

There are certain substances which conduct heat readily. It is well known how hard it is to hold the end of a metal spoon while the other end is in boiling water. No difficulty is experienced, if a wooden spoon is used. Wood, then, is a poor conductor of heat and metal a good one.


ICE-CREAM FREEZER

An ordinary ice-cream freezer has a container made of metal. This is so that the heat in the cream can easily be "conducted" to the freezing mixture to be used up in melting the ice and so disappear. On the other hand, the outside tub of the freezer is usually of wood. That is in order to keep the heat of the air from being easily conducted into the freezing mixture, lest this heat be used instead of that in the cream which is to be frozen. The difficulty with the wooden tub is that as it stands unused it is apt to shrink and then leak, and, besides, it is heavy

and clumsy. So some ice-cream freezers have a metal outside. They undoubtedly take a little more ice and salt to do the work, but otherwise are quite satisfactory.

References

Agri. Exp. Sta., Burlington, Vt. "The Principles and Practice of Ice-cream Making."

Questions

1. Why does an ice-cream freezer have a dasher?
2. Which is cheaper, ice or salt? How does this point affect the choice of the proportions of ice and salt to be used in a freezing mixture?
3. What proportion of ice and salt would you use for chilling?
4. How is ice cream packed and how is it covered for keeping?
5. Can you make an ice cream or an ice mixture so sweet it will not freeze? Why?
6. Can snow be used to make a freezing mixture instead of ice?
7. Could ice have been frozen as readily in a glass cup as in a tin cup? Explain.
8. Explain why cologne rubbed on the forehead feels cool.

Home Work

1. The following sherbet is very delicious, especially on a hot day. It is much cheaper than ice cream.

Lemon Milk Sherbet.

4 c. milk — $1\frac{1}{2}$ c. sugar
Juice of three lemons

Combine and freeze. Curdling will not affect the quality after freezing.

XLVII

MARKETING SUGGESTIONS

Prepare and Serve a Dinner.

Plan the menu, go to market to buy the necessary food, and keep account of the total cost. After the meal is served, note the left-overs and deduct their cost from the former total. Then calculate the cost of the meal per person.

Marketing Suggestions

Make Your Own Selections

Unless you know a good deal about marketing, you should go to the store yourself rather than order by telephone. It often happens, especially with perishable fruit and vegetables, that on any given day one store will offer at the same price much better food than another, or will offer the same quality at a better price. Then, too, just as you can save money by not buying an expensive cut of meat for a stew, so, also, you can save, for example, by buying less handsome apples for apple sauce than you might select for eating at table.

Plan Your Buying

Before you go to market have quite definitely in mind what you wish to buy. Be sure you have looked over

your home supplies to see what is already on hand. Decide how much you will need of each food. But be prepared to change your plans if market conditions make it desirable to do so. It may be well to think about it in some such way as this: "I shall need one fresh vegetable for to-day's dinner. I could use peas." Then when you get to market and find peas expensive, but green beans cheap, you could decide to substitute.

Food sold in bulk instead of in package form is usually cheaper. If the food is to be reheated, it is economy to buy it in the cheaper form. If it cannot be sterilized or properly cleaned by washing, it is true economy to buy the package form.

Cooked foods bought at delicatessen stores, and so forth, are usually expensive, as both fuel and labor are included in the price. Hot-house fruit and vegetables are often very expensive compared with the cost of the same food when it is "in season." But some people use canned goods when they can buy fresh foods at actually less cost.

Buy Advantageous Amounts

In buying ask for definite amounts by weight and measure. A bag, bottle, pail or bucket, jar, basket, or "five cents' worth", are all indefinite terms. Make your butcher give you the price per pound and the weight of the meat bought. Buy package goods that are clearly marked with the quantity they contain.

Buy only in quantities which you can use before deterioration. Buy, however, in as large quantities as you can plan to use without monotony, especially where by so doing you save a few cents or even a fraction of a cent; but remember that it is not economy to buy an extra amount and have some to throw away. Non-perishable goods are cheaper bought in quantity. Note the net

weight of package goods in relation to cost. A larger package is often much better value than a smaller.

Check Up on the Quantities Bought

See that you receive the amount of material for which you paid. It is necessary to have a pair of scales and weigh often enough to be sure that your dealer is not sending you short weight. If he is careless and gives you now too little, now too much, tell him you prefer to deal with someone who is more accurate. But don't conclude that he is dishonest because he makes an occasional mistake.

If you buy by measure, there are definite weights you should receive. You can obtain a table showing the weight of a bushel of various food commodities by applying to your State department of weights and measures. Divide those weights by four, to find the weight of a peck. Remember that the liquid pint and quart are smaller than the corresponding dry measures.

Cost and Food Value

Examination of the Table of the Cost of One Hundred Calorie Portions (at end of this book) shows at once that it is possible to pay widely varying prices for amounts of food having the same fuel value. It is entirely possible, then, to take this into account in selecting food.

Meat, for example, is costly, as is most protein food. But there is a great difference in the case of different kinds and cuts of meat. Here is one point to remember. Do not spend money foolishly in buying more protein than it is wise for us to have. Suggestions have already been made for ways of cutting down on the amounts of meat served.

Again, many vegetables and fruits are high in price compared to their actual food value. Consider, then, how much they are actually needed, and select as far as possible those which are less costly and supply the same elements. Include either a vegetable or a fruit in each meal, but not necessarily both.

Remember, however, that a certain amount of protein and mineral salts, as well as vitamins, are absolutely essential to health, and that to buy food solely from the standpoint of cost would be a fatal mistake. Remember that, while the amount of these necessary substances required is not very great, the need for them is absolute. Milk, for example, is very necessary for children, if they are to grow and develop properly, and a liberal amount should be included in their diet regardless of cost.

Some Specific Suggestions in Buying

1. Meats.

Learn the cuts of meat, the price paid per pound, and also the price per pound of edible meat. Apparent cheapness is often deceiving. Cheaper cuts are often more nutritious than more expensive ones.

On the following page are some figures given in Bulletin 158, University of Illinois Agricultural Experiment Station, 1912. While the present prices are not the same, nevertheless the figures show relative values.

2. Eggs.

Many people are prejudiced against cold-storage eggs. At certain times of the year it is necessary to use them in order to have a sufficient egg-supply. While their flavor may not be so delicate for eating, they are good food, and at such seasons should be preferred for use in cooking, for they are much less expensive.

Beef	Retail Price Per Pound	Cost of Edible Meat Per Pound
Steaks:		
Porterhouse	25	27.2–28.9
Club or short	20	22.6
Sirloin	20	20.6–24.2
Flank	16	16
Round	15	15.3–16.0
Chuck	12	13.1–14.1
Roasts:		
Prime rib, 1st cut	20	22.9
Prime rib, last cut	16	18.8
Chuck	15	17.3
Rump	12	12.8
Boiling and stewing prices:		
Round, pot roast	10	10.1
Shoulder, pot roast	10	11.6
Brisket	8	8.7
Vane	7	7.7
Flank, stew	7	7.1
Fore shank, stew	7	7.0
Neck	6	7.0

3. Milk.

Sour milk is valuable for making cottage cheese, or in baking, and should never be thrown away. Use it before it molds.

Skimmed milk and buttermilk, if they can be bought, cost less than whole milk. However, children need whole milk to drink, for they need the fat in the milk which contains the vitamin necessary to growth.

Canned milk keeps well and is sometimes cheaper for a small family.

Milk powder may also be used in cooking. It is made from skimmed milk.

Money spent for milk gives a good return, for milk contains all the food principles as well as valuable mineral salts and vitamins.

4. Tea, Coffee, and Cocoa.

Tea and coffee have no fuel value except for the milk, cream, or sugar added. Do not serve them oftener than necessary, and never to children. Coffee and tea bought in bulk are less expensive than in a carton or can. Cocoa is cheaper bought in bulk than in tin.

5. Sugar.

Sugar often sells for a certain number of cents and a fraction of a cent. It is economy to buy a number of pounds which will make the cost an even number of cents.

6. Cereals.

Flour usually costs the same in twenty-five pound sacks as by the barrel. Bought in ten-pound packages or less, the price is higher.

Bulk cereals, macaroni, and spaghetti, are less expensive than the package goods. Broken rice is as nutritious as whole rice, and less expensive.

Ready-to-eat cereals are more expensive than those which have not been cooked. If fuel must be burned merely to cook the cereal, that is another matter. However, a fireless cooker will solve that problem.

Home-made bread, if the baking or making is not included, is cheaper than baker's bread. Weight for weight, they are about equally nutritious. If the home-made bread is made with dried or liquid yeast instead of with compressed yeast it will cost still less.

7. FATS.

Butter is an expensive form of fat. Keep all meat fats (ask the butcher to send home the trimmings) and try them out. This may readily be done by chopping them fine, putting them through a meat-grinder and heating them over water. When the fat has melted, pour it off. Strong fats may be made less strong by heating with a little milk, about a cup to a pound. Sour milk may be used. Strong fats may be flavored with onions, apples, bay leaves, sage, thyme, etc.

QUESTIONS

1. In Section XXXI, the Five Food Groups were discussed. Make a list of as many foods as you can in each group and then divide them under the following headings: Cheap, Moderate-priced, Expensive.
2. Give as many reasons as you can why some stores can sell at lower prices than others. Is it always wise to buy at the lowest money cost?
3. What ways can you suggest for lessening the expensiveness of the dinner served in this section?

HOME WORK

1. Go to market for the family as often as you can. If you keep your eyes about you, you can learn a great deal by so doing, and it is fun to try to see whether you can plan really good meals at low cost.

XLVIII

FLOUR MIXTURES

Pop-overs

A. Prepare Pop-overs.

Use the following proportions:

Liquid (Milk)	Flour (Bread flour sifted)	Egg	Fat (Butter)	Salt
1 c.	1 c.	1	1 tsp.	½ tsp.

Mix as follows:

1. Beat white and yolk separately. Add the milk to the beaten yolk and add to the flour and salt. Stir in the melted butter and finally fold in the beaten white.
2. Add the milk to the flour and salt. Add unbeaten egg and melted butter and beat with a Dover egg beater until there are no lumps.

Pour each pop-over batter into hot, buttered, earthen molds or iron muffin pans, but do not fill molds more than quarter full. Bake in a hot oven[1] (482° F.) until the

[1] Test the heat of the oven at 482° F. with your hand. An "educated" hand is of the greatest help when trying to bake without a thermometer. Also test by putting a piece of white paper in the oven for five minutes and noting its color.

pop-overs are puffed and beginning to brown, then reduce the heat and finish baking. Allow thirty to thirty-five minutes for the whole baking. Compare results.

Pop-overs

B. **Class Experiments.**

1. Fill a cup with unsifted flour. Sift the flour and refill the cup, being careful not to pack the flour. Recipes always call for flour measured after sifting. Why?
2. Drop a teaspoon of unbeaten egg into hot fat. What immediately happens to the water in the white of egg? What makes pop-overs pop? Why is so hot an oven used?

Flour Mixtures

The Batter and Dough Series

Cream soup and white sauce are made with comparatively little flour for the liquid used, and without the use of eggs. Beginning with pop-overs come a series of thick-

ened mixtures, usually with more or less egg. Of these, the more liquid are termed batters. A mixture thin enough to pour is called a "pour-batter"; it is about as thick as thin cream. Then comes a "drop-batter", thicker than a pour-batter but still liquid enough to drop from a spoon, "breaking" when it is poured. It has the consistency of thick cream. Thicker than this is "soft dough"; then, still thicker, is "dough." Obviously pop-overs are a pour-batter; so are griddlecakes. Muffins are drop-batter, baking-powder biscuits are soft dough, and bread is dough. Cookies and pastry are still stiffer mixtures. But none of these terms are exact, because the proportions of flour and liquid in any one may vary a good deal. Also, it will readily be seen that eggs act as a liquid until they are cooked, and that fat is liquid while it is melted. All these things, therefore, must be taken into consideration. Then, one flour differs from another in its gluten content, so, therefore, in the amount of liquid it can absorb. But in spite of all this, quite accurate results can be obtained with definite proportions, until one comes to a mixture like bread which must be handled.

How to Remember Proportions

In considering the whole question of proportions, think of the liquid as fixed in amount, one cup, and then the proportion of flour used with it. In pop-overs equal amounts are used, one cup of each. Therefore, pop-over batter is said to be 1 : 1, — one cup of liquid to one cup of flour. As griddlecakes, fritter-batter, muffins, and bread vary mainly in the amount of flour used, this is an easy way to remember proportions. Cake ordinarily contains so much fat or so many eggs that these must be taken into consideration in counting liquid.

Methods of Mixing

The method of mixing depends upon the leavening agent and the result to be accomplished. If the leavening is steam, as in pop-overs, beating in air is evidently unnecessary. Therefore, the separate beating of the egg, folding in the white, gives no better pop-overs than are obtained by the shorter method. Beating the flour with the liquid develops the gluten in it, which is necessary to retain the steam which expands and so makes the pop-overs hollow. Notice in each mixture exactly how you combine the ingredients and see the reasons in every case.

Baking is much easier if a thermometer can be used in the oven, because then the temperature can readily be measured and not guessed at. Many home ovens can quite easily have a hole bored, so that a thermometer can be inserted. The result is more accurate than the results obtained from oven thermometers. With gas ovens, it is possible to tell with a little practice how hot a given oven is by the length of time the gas has been lighted and the degree to which it is turned on. Many ovens bake unevenly. This is especially likely to be true of small ovens. In these, care must be taken not to put pans too near the sides. It is impossible to get good results if such an oven is filled too full. A pan of water will help cool an oven; an asbestos mat placed under a pan will keep the bottom from baking too fast; paper put over the top will keep the top from browning too rapidly. But all these ought to be unnecessary with a good oven and sufficient skill in baking.

Reference

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. Is pour-batter an appropriate name for batters of the type of pop-overs?

2. Compare the proportions of flour to liquid in cream soups, white sauces, and pop-overs. Also with the amount of flour you would have to substitute for cornstarch to make a mold. Compare the textures when cooked.

Home Work

1. Look up recipes for cream puffs, cream cakes, éclairs. How do these compare in proportions with the pop-over recipe?

If you mixed cream puffs as pop-overs and attempted to bake them on a flat surface what would happen? Account, then, for the partial cooking of the flour during the mixing.

2. Make pop-overs at home.

XLIX

LEAVENING

Apple Fritters
Corn Fritters

A. **Class Experiments.** THE PRINCIPLE OF LEAVENING.

1. Tie a piece of rubber sheeting over the top of a test tube, cool the tube, then heat it slightly. Notice the effects on the rubber. What effect has heat and cold upon the volume of the air in the tube?
2. How is the gas held in the dough?
   Mix one teaspoon of flour with an equal amount of water. Repeat, using cornstarch instead of flour. Notice the difference in the result. To explain: mix a $\frac{1}{4}$ c. flour with water (a teaspoon at a time) to make a stiff dough. Wash, by kneading it gently in a bowl of cold water, until the part left, the gluten, no longer gives a blue color with iodine. (What has been washed out?)
   a. Reserve a pinch of the gluten; divide the rest into two balls. Bake one in a hot oven, the other in a slow oven. Explain difference in results.
   b. With the piece reserved, determine if gluten is protein.

B. Apple Fritters.

Prepare a pop-over batter, using $\frac{1}{2}$ c. liquid. Pare and core two apples and cut crossways into slices. Dip a slice into the batter. Is it thick enough to make a cover for the apple? Add enough flour to make a "cover-batter." Record proportions used. Dip the slices of apple in the batter, fry in deep fat and serve with syrup.

Leavening

The term leavening means "making lighter." Bread is leavened and, instead of being a solid, heavy mass, is spongy, light, and porous. The process is supposed to improve not only the flavor but the digestibility of the mass.

Steam as a Leavening Agent

The principle of all leavening is the expansion by heat of some gas which is thoroughly mixed through the batter or dough. In cooking, there are three agents which are commonly used in leavening doughs. The first of these is water vapor or steam. This, as in the pop-overs, is manufactured from the water present in the batter by the heat of the oven. Then further heat expands the steam still more. At the same time the heat hardens the expanded gluten, so that after a while no further stretching is possible. This explains why muffins and cake rise in the oven only at the beginning of the baking.

Air as Leavening

The second agent is air. This is mixed in a batter in two ways, — it may be entangled in the batter itself by beating rapidly, or it may be beaten into egg and then folded into the batter. Even snow may be folded in like

egg and introduce some air into the mixture. When the batter full of tiny bubbles of air is heated, this air expands and, stretching the gluten by which it is held, it makes larger holes, thus leavening all the mass and making it rise.

Carbon Dioxide from Yeast as Leavening

Carbon dioxide is the third agent. This may be forced into the dough, a process, however, which is never used at home and rarely elsewhere. Carbon dioxide is, instead, manufactured in the dough itself. When yeast is put into bread, one is really starting a plant to grow. The plant feeds mainly on sugar. If cane sugar is present, it turns it first into glucose and fructose sugars and then breaks these up into carbon dioxide and alcohol. The heat of the oven acts on carbon dioxide exactly as it does on water vapor or steam, expanding it into larger bubbles. As alcohol is more easily turned into vapor than is water, it becomes a gas and, expanding, helps in the leavening process.

The other method of introducing carbon dioxide into doughs and batters will be shown in the next lesson.

Reference

U. S. Dept. of Agriculture. Farmers' Bulletin, No. 1136. "Baking in the Home."

Questions

1. What effect has heat on gluten?
2. What other proteins are hardened by heat?
3. After pop-overs are thoroughly baked, and cool, what becomes of the steam? Why are they better eaten hot? Compare them to baked potatoes in this respect.
4. Why does an insufficiently cooked pop-over fall, when it is taken out of the oven?
5. Calculate the cost of pop-overs. How do they compare with the cost of the bread that they would replace in a meal?

Home Work

Make corn fritters.

Corn Fritters.

1 can corn	2 tbsp. milk
1½ tsp. salt	¾ c. cracker crumbs
⅛ tsp. pepper	1 egg, beaten
Bacon fat	

Put corn into a saucepan and, after letting it stand for half an hour, bring it to boiling and then let it simmer for a quarter of an hour. Add the other ingredients and drop from a spoon into a little hot bacon fat in a frying pan. When one side is brown, turn each fritter and brown the other side.

L

SODA

Sour-milk Griddlecakes
Spider Corn Cake

A. **Class Experiments.** Soda as a Leavening Agent.

1. To find out why soda makes cake light.
   Add a teaspoon of vinegar to a pinch of soda in a test tube. Tip the tube and hold the mouth of this just above another containing a teaspoon of lime water. After a moment, cover the mouth of the lime-water tube and shake it. What is present? What caused the bubbles in the first tube?
2. What kind of substances must be put with soda to produce this gas?
   a. Dip a piece of blue litmus paper into vinegar and note the effect on paper. Hold it in the fumes of ammonia, an alkaline substance, and see the result.
   b. Now test the following and determine whether they are acid, alkaline, or neutral (neither acid nor alkaline):

      1 — water.
      2 — sour milk.
      3 — sweet milk.

4 — molasses and water.
5 — cream of tartar dissolved in hot water.
6 — thin starch paste.
7 — soda and water.

c. Pour a few drops of soda and water into each of the tubes. Which cause effervescence?

3. Will bubbles of gas go on forming indefinitely? To a little soda and water add, successively, small amounts of vinegar. Do bubbles continue to form? Has all the gas in the soda been set free? Has soda an agreeable taste? What would be the difficulty, if there were more soda in bread or cake than the acid present could act upon?
4. How much soda can be used with a given amount of acid? Dissolve a teaspoon of soda in a quarter of a cup of water in a measuring cup. Then dilute half a cup of thick sour milk with about half a cup of water. Add, slowly, the soda solution to the sour milk until it is neutral to both red and blue litmus paper. Calculate the amount of soda to use with one cup of sour milk.
5. What effect has hot water on soda? To a little soda in a test tube add a teaspoonful of boiling water. Is gas given off? Test the water with a piece of pink litmus paper.

B. Prepare Sour-milk Griddlecakes.

Use the following proportions:

Liquid (Thick, sour milk)	Flour	Egg	Fat (Melted butter)	Salt	Soda
1 c.	1 to $1\frac{1}{4}$ c.	1	1 tbsp.	1 tsp.	?

How will you combine the ingredients? Cook by dropping spoonfuls of the batter on a griddle or frying pan, using enough fat to keep the cakes from sticking. A soapstone griddle should not be greased. When the cake is full of bubbles and the under side is brown, turn the cakes over, using a spatula or a cake-turner, and brown the other side also.

Soda

Soda has two chemical names: bicarbonate of soda, and acid sodium carbonate. In spite of the latter name, soda is alkaline to litmus and not acid in any of its properties. It is manufactured from common salt by a number of different processes.

Saleratus

Our grandmothers used saleratus in place of soda. This is bicarbonate of potash and, like soda, gives off carbon dioxide when it is combined with an acid. As this was originally manufactured it was not finely powdered, but in a more or less scaly mass which could by no means have been easily sifted with the flour in making use of it. In order, then, to get it properly mixed, it was necessary to dissolve it in the liquid used. This probably accounts for the many cooks who still dissolve the soda in the sour milk used with it, instead of sifting it with the flour. This is, obviously, a waste of soda, because all the gas which bubbles off is lost as leavening, since there is no gluten present to retain the gas.

Sour Milk and Soda

Since definite amounts of acid act on definite amounts of soda, a question naturally arises in regard to the acidity of sour milk. Is it always uniformly acid? This must

be answered in the negative for milk that has not clabbered. But after that stage has been reached, the acidity remains fairly constant, until changes take place in the milk which render it unfit for food. Therefore, the proportion of soda that can wisely be used with a cup of clabbered milk is a definite one. Many recipes, especially when enough other flavoring, such as chocolate or spice, is used to disguise the taste of an excess, call for a larger proportion of soda. The result is greatly improved if the soda is reduced to the correct amount, and if more leavening is needed the added amount is supplied by the addition of baking powder.

Sour Milk and Molasses

Great caution must be taken when molasses is used to act as the acid with soda. Modern molasses is entirely different in respect to its acidity, being always much less acid than of old. It is safer to allow not more than a quarter of a teaspoon of soda to a cup of molasses, if the molasses is bought in bulk. Use baking powder for the rest of the leavening. If the molasses is canned, it may have practically no acidity whatever, and baking powder should be used instead of any soda.

Reference

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. How does baking soda differ from washing soda?
2. What finally becomes of the carbon dioxide gas from the soda used in griddlecakes?
3. Is carbon dioxide harmful?
4. What is soda water? How is it made?

5. Wherein lies the chief danger of drinking soda water at a public store if it is managed carelessly? Are there any laws in your town or city governing this?

6. Why is soda soothing to a burn? When should it not be used for this purpose?

Home Work

Try the following recipe:

Spider Corn Cake.

1 egg	1 tbsp. sugar
1 c. sour milk (clabbered)	1 tsp. salt
$\frac{3}{4}$ c. corn meal	1 tsp. soda
$\frac{1}{3}$ c. flour	1 tbsp. lard or butter

Beat the egg, then add the sour milk and stir in the dry ingredients, mixing thoroughly. Melt the fat in a frying pan or "spider" and pour in the batter. Bake in a hot oven for twenty minutes.

LI

LEAVENING

SWEET MILK GRIDDLECAKES
SPONGE CAKES

A. **Class Experiment.** BAKING POWDER.

1. Mix a little soda and cream of tartar. Does anything happen? Add water. What test with litmus paper was given by cream of tartar and water?
2. Pour a tablespoon of water on half a teaspoon of baking powder. Is gas given off? From this experiment what two substances do you suppose that baking powder contains?
3. Boil (2). When cool, add iodine. What third substance does this show is present?
4. Why starch is used.
   Stir together half a teaspoon of starch and half a teaspoon of water. What becomes of the water? What happens if the soda and acid in baking powder becomes moist? Why is starch added?
5. Weigh out one ounce of soda and two and a quarter ounces of cream of tartar. Add half an ounce of starch. Mix thoroughly and sift. Compare the cost of this with the cost of an equal weight of purchased cream of tartar baking powder.

B. Prepare Sweet Milk Griddlecakes.

Use the following proportions:

Liquid (Milk)	Flour	Egg	Fat	Salt	Baking Powder
1 c.	$1\frac{1}{4}$ c.	1	1 tbsp.	1 tsp.	2 tsp.

The usual amount of baking powder is two teaspoons to each cup of flour if no eggs are used. If eggs are used we may omit one-half teaspoon of baking powder for each egg used. How does the amount of soda used in the sour milk griddlecake recipe compare with the amount of baking powder used here?

C. Prepare Sponge Cake.

Use one-fourth of the following recipe. Bake in an oven at 338° F.

Yolks 4 eggs
1 c. sugar
1 tsp. lemon juice
Grated rind one-half lemon
Whites 4 eggs
1 c. flour (pastry)
$\frac{1}{4}$ tsp. salt

Beat yolks until thick and lemon-colored. Add sugar gradually, and continue beating. Add lemon juice, rind, and whites of eggs beaten with the salt until stiff and dry. When whites are partially mixed with yolks, remove beater, and carefully cut and fold in flour sifted three times. Bake one hour in a slow oven, in an angel-cake pan or deep narrow pan.

Baking Powders

While baking powders are now practically all made with soda as the carbonate, many different substances are used

A Sponge Cake

for acid. There are three distinct types of powders, classified according to their composition.

Cream of Tartar Powders

The oldest type is made with cream of tartar. This is a substance which is found abundantly in grape juice. If grape juice stands in wooden kegs, cream of tartar crystallizes out in masses on the inside. This crude substance, argol as it is called, is then purified by being dissolved in water, filtered, often through bone black, so as to remove the coloring matter of the grapes, and then re-crystallized and ground. This baking powder keeps well because the cream of tartar is not easily soluble in water and so is not much affected by the dampness in the air. This means that not much "filler" has to be used to keep it dry. Since, however, this lack of solubility means that this baking powder does not act appreciably until the flour mixtures are heated, we frequently find

that tartaric acid as well as cream of tartar is used in tartrate baking powder.

When cream of tartar acts with the soda, besides the carbon dioxide another substance, known as Rochelle salts, is formed. This substance is used as a purgative in medicine; but so little of it results from the amount of baking powder ordinarily used in cooking that probably it has little or no effect on the human system.

Phosphate Baking Powders

Phosphate powders, a second type of baking powder, are usually made with acid calcium phosphate. In that case the residue, like that of tartrate powders, is also purgative, but probably no action is caused from the amount usually eaten. At least one of the phosphate powders does not use acid calcium phosphate, however.

Phosphate powders give a good deal of gas, but the gas is evolved very quickly. More filler is used because of this than is necessary in tartrate powders.

Alum Baking Powder

The third class, alum powders, contains now most commonly sodium alum, that is, sodium aluminum sulphate, and since alum is very soluble, even more filler is used than in the phosphate powders. In these powders the evolution of gas is much more continuous than in the phosphate types. Much objection has been made to these powders, because it was feared there might be injurious effects from the alum used, and in some countries its use is forbidden. Such powders may be sold legally in this country, however, if the label is truthful. Probably the truth of the matter is that too much of any of them is not good for digestion, but that, as ordinarily used, they are all harmless. Nor do we ordinarily make much account of

the difference in ingredients in our actual use of baking powders. Anyone who objects to alum powders can use a phosphate powder in place of the more expensive tartrate powder.

Mixed Powders

Besides these three distinct types, there are mixed powders in which more than one acid is used. Alum powders, for example, are now usually mixed with phosphate to make the evolution of gas more continuous.

Sometimes, instead of baking powder, cream of tartar and soda are used in cooking. For one teaspoon of soda two slightly rounded teaspoons of cream of tartar are allowed. This does not give such good results as are obtained with purchased baking powders, because the measuring of the soda and acid is not nearly so accurate, nor is the mixing so thorough. Some recipes for home-made powders call for as many as a dozen siftings and are, therefore, rather laborious to make.

Since over two parts of cream of tartar are used for one of soda, and since in tartrate baking powder there is also some filler present, ranging from seven to about twenty per cent, it will be seen that only about one-fourth of the baking powder is soda. If, therefore, we wish to substitute baking powder and sweet milk for soda and sour milk, about four times as much baking powder as soda must be used.

Reference

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. Correct the following recipe for sour-milk gingerbread by calculating the amount of soda to use with this amount of molasses, and with the amount of sour milk. Subtract the sum from the

amount of soda given in the recipe. What is the amount of the extra soda? How much baking powder will you add to replace the extra amount?

1 c. molasses	$1\frac{3}{4}$ tsp. soda
1 c. sour milk	2 tsp. ginger
$2\frac{1}{2}$ c. flour	$\frac{1}{2}$ tsp. salt
$\frac{1}{4}$ c. melted butter	

2. What is the leavening in sponge cake? Why does it need a cooler oven than ordinary cake?

Home Work

1. Find out the cost per pound of baking powders of the different types found on your market. What are the regulations in regard to baking powders for sale in interstate commerce? Have you state or city regulations in regard to baking powders?

2. Sponge cake made with hot water and baking powder costs less and is easier to make than real sponge cake. It is very good, especially when fresh. Perhaps you would like to try this recipe. It should make a dozen and a half small cakes, or one loaf.

Hot-water Sponge Cake.

2 egg yolks	2 egg whites
1 c. sugar	$\frac{1}{4}$ tsp. salt
2 tbsp. hot water	1 c. pastry flour
$\frac{1}{2}$ tsp. vanilla	$1\frac{1}{2}$ tsp. baking powder

Beat the yolks until thick, then put in the sugar slowly, then the hot water. Add the salt to the whites and beat them stiff. Sift the flour and baking powder together and add them to the yolk mixture, then add the vanilla, and finally fold in the whites. The oven should be hotter

than for a true sponge cake. Be sure the cake is really done or it will fall when it cools. It is safest to leave it in the oven about ten minutes after it seems done. Sift a little sugar over the top either before or just after baking.

LII

KINDS OF FLOUR

MUFFINS
BOSTON BROWN BREAD

A. PREPARE MUFFINS.

Use the following proportions:

	LIQUID (Milk)	FLOUR	EGG	FAT (Butter)	SUGAR	SALT	BAKING POWDER
1.	1 c.	2 c.	1	1 tsp.	1 tbsp.	½ tsp.	?
2.	1 c.	2 c.	1	2 tsp.	1 tbsp.	½ tsp.	?
3.	1 c.	2 c.	1	2 tsp.	2 tbsp.	½ tsp.	?

What is the effect of fat as shown in (1) and (2)? Of sugar as shown by (2) and (3)?

B. **Class Experiment.** WEIGHT OF FLOURS.

Weigh a cup of each of the following:

1. Bread flour sifted once.
2. Whole wheat or graham flour. (Sift, but replace the bran.)
3. Corn meal.
4. Rye flour.

C. Prepare Muffins.

Follow the proportion given in (*A* 2), but use only one-half of the amount of the flour. Use a weight of one of the other flours equal to the weight of the omitted flour.

Kinds of Flour

More than one kind of flour is manufactured from wheat. The preparation of bread flour has already been described, and it will be remembered that in its manufacture all of the bran coatings are removed.

Graham and Whole Wheat Flour

When none of the outside layers of the wheat is removed, but all are ground up together, true graham flour is produced. This flour was named after an American physician, Dr. Sylvester Graham, who invented the process. He advocated this, because of the supposed wastefulness of throwing away so much nutriment as chemical analysis showed remained in the discarded bran. Later, it was discovered that this nutriment, largely protein, was most abundant in the aleurone or inner layer of the bran. Therefore, it was argued, the outer coats could be discarded and only the inner layer ground with the kernel, producing a flour which would be less coarse, but would preserve the whole nutriment of the wheat. Accordingly, this received the somewhat misleading name of whole wheat flour, a name which would really much more accurately describe graham flour.

For a while after this flour was put on the market, much was to be heard about the superior nutritive value of whole wheat bread, compared with bread made from white flour. Later work has shown that the cells containing the protein in the aleurone layer are so tough that few of them are broken in the grinding, and so the protein present

is not digested easily. Moreover, the whole mass passes so much more rapidly through the digestive tract that experiment shows that practically the same amount of nutriment is actually absorbed from bread made from the coarser varieties of flour. These breads do have their place in the diet, however, because they contain more mineral matter and a little more vitamin than white flour, and they are certainly more laxative. This latter action is probably due partly to the mechanical stimulus of the coarser bran particles, but partly, also, to the oil in the germ as well as to the effect of one of the phosphorus compounds which is especially abundant in the bran.

Use of Flours in Bread-making

Rye is the only flour besides wheat flour which contains sufficient gluten to make risen bread, and rye bread is much more moist and dense than white bread. Nearly all recipes, even for graham and whole wheat breads, call for the addition of some bread flour. In making corn-meal muffins, for example, from one-third to two-thirds of the flour as given in an ordinary recipe for muffins may be substituted with an equal weight of corn meal. The more flour used in proportion to the corn meal, the lighter the muffins, but, of course, there is also less and less flavor of corn meal.

Corn meal is made from different varieties of corn giving a white or yellow meal. Southerners generally use white corn meal, and northerners yellow, each claiming a superiority for their product. There is an undoubted difference in flavor, but which is better is a matter of taste each individual must settle for himself.

Reference

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. Describe the wheat kernel.
2. What care should be taken in storing flour?
3. Discuss the relative value of white, graham, and whole wheat bread in the diet.
4. How does the nutritive value of a pound of flour compare with that of a pound of cornstarch? Of corn meal? Of beef (the round)? Compare the cost of a hundred-calorie portion of each, as well as the cost per pound.
5. How many muffins of average size can you make from two cups of flour?
6. Write a recipe for muffins made with sour milk.

Home Work

1. Make muffins at home. If you wish fancy muffins, just before you pour the batter in the muffin tins, stir in about one-third of a cup of dates (stoned, cut in pieces, and sprinkled with flour) for each cup of flour.

Boston Brown Bread
Baked in baking-powder tins

2. If you like Boston brown bread, try this recipe:

BOSTON BROWN BREAD.

1 c. rye meal	$\frac{3}{4}$ c. molasses
1 c. corn meal	2 c. sour milk
1 c. graham flour	If desired, 1 c. raisins sprinkled with flour. Large raisins should be cut in half.
$1\frac{1}{4}$ tsp. soda	
3 tsp. baking powder	
1 tsp. salt	

Put the molasses and milk together, then mix the dry ingredients thoroughly and add them to the liquid. Stir well. Bake in the oven in well-greased and covered one-pound baking-powder tins, filling them not more than two-thirds full; or pour the batter into a five-pound lard pail and steam for four hours.

LIII

CAKE-MAKING

FROSTED CAKE
EGGLESS, BUTTERLESS, MILKLESS CAKE

A. MAKE A PLAIN CAKE.

Use one-half of the following proportions:

LIQUID (Milk or Water)	FLOUR (Pastry)	FAT (Butter)	SUGAR	EGGS	BAKING POWDER
1 c.	3 c.	½ c.	1½ c.	4	4 tsp.

Add a few grains of salt and a few drops of flavoring. Half the class mix as in (1), the other half as in (2). Compare the appearance of batters before baking and of cakes after baking. Which method of mixing takes less time? Bake cake at 385° F., in greased pans only two-thirds full, until it shrinks away from the sides of the pan and springs back into place when gently pressed on top with the finger.

1. Cream the butter, adding the sugar gradually, until the two are as well mixed as possible. Add the beaten yolks of eggs, and then alternately liquid and flour sifted with the baking powder. Finally, fold in the stiffly beaten whites.

2. Put the sugar in a bowl and pour in the liquid. Stir and let stand, while you separate and beat the eggs. Add the beaten yolks and the butter melted. Gradually stir in the flour sifted with the baking powder and finally fold in the stiffly beaten whites as before.

B. FROSTING.

Frost cake with Frosting I, II, or III.

I

Without egg

1 c. powdered sugar
2 tbsp. liquid { water, milk, cream, orange juice, etc.
1 tbsp. lemon juice

II

With egg

1 c. powdered sugar
1 egg white
1 tsp. flavoring

Beat with a spoon till mixture begins to thicken.

III

1 c. granulated sugar
3 tbsp. cold water
1 egg white
$\frac{1}{2}$ tsp. vanilla

Beat the first three ingredients in double boiler, over boiling water until the consistency is right to spread (about 8 minutes). Add the vanilla.

C. **Class Experiment.**

BREAD FLOUR AND PASTRY FLOUR.

1. Compare bread flour and pastry flour:
   a. Color.
   b. Feeling.
   c. Packing in hand when pressed.
2. Weigh a cup of pastry flour (sifted once). Compare with the weight of a cup of bread flour de-

termined in the last lesson. How much bread flour is equal in weight to a cup of pastry flour?

3. Fill a cup with pastry flour. Sift and remeasure. Continue sifting as long as there is any increase in volume. How many times is it worth while to sift flour for cake?
4. Wash out the gluten from equal weights of the two flours and compare the amounts obtained. (Add water gradually to make a dough ball which can be handled. Knead in the palm of the hand under running water or in a bowl, until all of the starch has been removed. How can this be tested? Bake a small portion in a hot oven as for pop-overs.)

Cake-making

At first glance there seems to be an almost endless variety of recipes for cake. Even omitting flavorings as variations, there are still plain cakes, and rich cakes, differing in the amount of egg, sugar, and butter used, until one almost concludes that any proportions will do. But on further analysis certain fundamental facts can be distinguished.

Proportions of Flour and Liquid in Cake

Notice, first, the proportion of liquid to flour in cake recipes. Whether the butter is melted in mixing or not, it melts in the oven and then counts as liquid. The fat, then, as well as the liquid, must be counted. If a richer cake is desired than the one made in the laboratory, the amount of butter can be increased if the amount of liquid is correspondingly decreased. For example, good cake can be made with three-quarters of a cup of butter and three-quarters of a cup of liquid, or with a cup of butter and a

half a cup of liquid. In any of these cases the sum of the two is still one and a half cups. In "pound cake" the whole amount is butter, and no liquid proper is used.

UTENSILS USED IN MAKING CAKE

Eggs, on the other hand, while they increase the liquid before baking, do not count as liquid after heat is applied. The sponge-cake recipe would call for eighteen eggs to three cups of flour, with three tablespoons of lemon juice. Notice the very large number of eggs necessary when so little liquid is used. In pound cake the proportions for three cups of flour would be only seven and a half eggs because of the butter used.

Effect of Sugar

Sugar makes the cake more crumbly as more and more is added, and increases the size and the lightness, but, meanwhile, the crust becomes sticky and tough, and the cake sweeter and sweeter. The amount of sugar in the general recipe may be increased to two cups if one likes a sweeter cake. If chocolate is added, the larger amount of sugar is desirable.

Leavening in Cakes

The leavening in a cake of the type that is being discussed, is mainly the gas from the baking powder, and a skilled cake-maker can get good results without beating the eggs separately. But in pound and sponge cake, where no baking powder is used, great pains in folding in the egg must be taken, and one sees why nearly twice as many eggs for the same amount of flour are used.

Methods of Mixing

If one is making a butter cake, the great question is in regard to mixing. The problem seems to resolve itself into the easiest way to get the ingredients blended very thoroughly. Hard butter is difficult to mix, also unbeaten egg. If the butter and sugar are not well creamed, the grain of the cake is coarse. On the other hand, the butter may be melted and successfully combined. Since beating flour with liquid develops the gluten and so makes the cake tougher, this should be avoided as far as possible. For this reason the melted butter is better beaten in before adding the flour, instead of afterwards. Melting the butter saves much time. It is especially convenient in making chocolate cake, for the chocolate can be melted with the butter.

Questions

1. Why is pastry flour desirable in making cake?
2. Account for the rule: If bread flour is used in place of pastry flour take out two tablespoons for each cup of flour called for in the recipe.
3. In making cake what would be the effect of using bread flour mixed with a little cornstarch, say half a cup of cornstarch to two cups of flour?

4. What ingredients are changed in making a muffin mixture into a cake mixture?

5. Change various recipes for cake to a three-cups-of-flour basis, and see how the ingredients called for correspond to the general rule.

Home Work

A good deal of skill is needed in cake-making. For this reason it is well to practice making cake as often as opportunity offers.

While cakes with little or no fat in them do not keep well, they are often delicious while fresh. Here is a very economical recipe:

Eggless, Butterless, Milkless Cake.

1 c. brown sugar	$\frac{1}{3}$ c. lard, melted
1 tsp. powdered cinnamon	2 c. raisins (seeded)
$\frac{1}{2}$ tsp. powdered clove	2 c. flour
1 c. hot water	5 tsp. baking powder
$\frac{1}{2}$ tsp. salt	

Boil the sugar, spice, and water together for three minutes. Let stand until cold. Sift the flour, salt, and baking powder together, sprinkle a little over the raisins. Add the melted lard to the cold syrup, then stir in the dry ingredients. Bake the cake for three-quarters of an hour in a moderate oven.

LIV

BAKING-POWDER DOUGHS

Baking-powder Biscuit
Fruit Shortcakes
Gingerbread

A. Prepare Baking-powder Biscuits.

Use one-half of the following recipe:

Flour	Fat	Salt	Baking Powder	Milk
1 c.	1 tbsp.	$\frac{1}{2}$ tsp.	Usual proportion for 1 c. flour	?

Add milk. Find out how much is needed to make:

(1) a stiff batter to be dropped from a spoon into muffin tins, or

(2) a very soft dough which can be patted and rolled out from one-half to one inch thick and cut into biscuit, or cut into small pieces and patted into shape. The dough should be so soft that it is sticky. Bake in an oven at 425–435° F. from twelve to fifteen minutes.

a. Bake one biscuit at once.

b. Bake another after letting it stand from fifteen minutes to a half an hour.

c. Bake a third biscuit in a slow oven.

d. Bake a fourth after kneading the dough or vigorously stirring the batter.

Compare the results and decide what precautions must be taken to make good biscuit.

B. Make Prune Shortcake.

Make a baking-powder biscuit dough, but use twice or three times as much fat. Roll thin and place it in a well-greased baking pan. Spread it with a little butter, then cover it with a layer of prunes which have been soaked over-night, stoned, and cut in halves. Sprinkle with a little brown sugar and cinnamon and bake fifteen minutes in a hot oven. Cut in squares and serve with cream.

For Strawberry Shortcake.

Bake dough in two layers, buttering the top of the lower layer. When done, cool slightly and split cake into separate layers; put crushed and sweetened fruit between, whole fruit on the top.

Sour-milk Gingerbread.

Use corrected recipe in Question 1, Lesson L.

Baking-powder Doughs

Baking-powder Biscuit

There are two types of rolled baking-powder biscuits, one small and practically all crust, the other larger, lighter, and with comparatively little crust. To make the first, the biscuits are rolled thinner and baked farther apart than those of the second type which is, perhaps, the more conventional.

Baking-powder Biscuits

The biscuits, which are made so soft as to drop and which need the support of muffin tins to give them shape, are more crusty than the more usual rolled biscuit. They are often called "emergency biscuit", because they can be prepared so quickly.

Methods of Mixing

After the liquid is added, any of these doughs should be worked as little as possible for, if they are, the gluten will be developed too much. This is the reason why the fat is worked in before the liquid. The fat can be cut in easily with two knives, or worked in with a fork, or rubbed in with the fingers. Since it is easier to combine the fat when it is cold, the first methods are to be preferred, especially in warm weather. With as stiff a mixture as this, there is no escape of gas from the dough and the biscuits can stand without harm for a time before they are baked. In fact, standing for a moderate period is

slightly advantageous, because it gives time for some of the gas to be evolved before the dough is baked too much to rise. With a batter such as is used in griddlecakes, the gas generated soon escapes, and if the batter is kept over until another meal more baking powder must be added before using.

Other Uses for Baking-powder Dough

Baking-powder biscuit dough, or a dough made with slight variations, is used in many ways. It is often used as a crust for meat pies, and sometimes for a deep fruit pie, in both cases there being no lower crust. It may also be used for fruit dumplings. Sometimes baking-powder biscuit dough is rolled out and sprinkled with maple sugar, or with sugar, cinnamon, raisins and currants, or citron. The dough is then rolled up and cut off in pieces somewhat less than an inch thick, and baked as biscuit. This dough may have some sugar added in the making. Shortcake is only baking-powder biscuit dough with more fat, usually double the amount. Dutch apple cake may be made as a modification of the baking-powder biscuit recipe. Sour milk or soda biscuit are made in exactly the same way as baking-powder biscuit, except that sour milk and soda replace the sweet milk and baking powder.

Reference

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. Write a recipe for soda biscuit.
2. Is the habitual use of hot breads to be recommended?
3. What is the advantage of patting baking-powder biscuit into shape, instead of rolling the dough?

4. If too much flour is used in shaping the biscuit, what is the result?

5. What is the difference in the result, if butter instead of lard is used as the fat? If half butter and half lard is used? What other fats may be used?

6. What is the effect on the texture of increasing the fat?

7. What is the effect on the texture of increasing the sugar?

8. How many average-sized biscuits will one cup of flour make? How much flour would you allow for biscuits for breakfast for a family of five?

Home Work

Here are two variations of the recipes used in this lesson. Try them.

Dutch Apple Cake.

½ egg	1 c. flour
⅓ c. milk	2 tsp. baking powder
2 tbsp. melted fat	¼ tsp. salt

2 or 3 apples, pared and cut in small, thin, wedge-shaped pieces
2 tbsp. sugar
¼ tsp. cinnamon

Beat the egg and add the milk and fat to it. Sift the dry ingredients and stir them lightly into the liquid to form a soft dough. Add more milk if the dough is not soft enough to spread easily. Spread it out in a greased baking pan and cover the top with the pieces of apple, slightly overlapping each other; then sprinkle on the cinnamon and sugar. Bake in a moderate oven until the apple is soft and the crust is brown.

Hot-water Gingerbread.

½ c. boiling water	2 c. flour
1 c. molasses	1 tsp. soda
¼ c. fat	2 tsp. ginger

Add the water to the fat and molasses. Sift the dry ingredients and beat the other mixtures together vigorously. Pour into a shallow greased pan, or into muffin tins, and bake from twenty to twenty-five minutes in a moderate oven.

LV

COOKIES

Rolled, Dropped, and Sliced Cookies

A. **Class Experiments.** Yeast.

I. Blend two yeast cakes with two cups of lukewarm water in which two teaspoons of molasses have been mixed. Divide into four portions.

1. Freeze the first and then let it stand at room temperature.
2. Boil the second and let it cool to room temperature.
3. Use the third as it is.

In turn, fill a test tube with part of each of these three portions and invert in the remaining liquid, taking care not to admit bubbles of air into the tubes. Use cups or tumblers, if no beakers are at hand. While inverting, the test tubes may be covered with a thumb or a piece of stiff paper. Keep at room temperature, and note result after an hour or two.

4. Chill the fourth portion, fill a test tube with the mixture and invert as above, and place in an ice-box, or out of doors if it is cold weather. Compare the result with the others after the same length of time.

II. Examine under a microscope yeast from an actively fermenting liquid, and make a drawing of a "plant."

III. Observe the action of yeast with the following food materials and account for the results. Use yeast cake and liquid in each case. Invert in test tubes as before.

1. Water.
2. Water with one tsp. of flour.
3. Milk.
4. Water in which potatoes have been cooked.
5. Water and one tsp. of starch.
6. Water and one tsp. of sugar.

B. MAKE SUGAR COOKIES OR GINGER SNAPS.

SUGAR COOKIES.

2 tbsp. fat	$\frac{1}{2}$ tsp. soda
$\frac{1}{4}$ c. sugar	$\frac{1}{4}$ tsp. baking powder
$1\frac{1}{2}$ tbsp. egg	$\frac{1}{2}$ c. flour and amount necessary to roll
1 tbsp. sour milk	

A few drops of vanilla

GINGER SNAPS.

$\frac{1}{4}$ c. brown sugar	$\frac{1}{4}$ tbsp. cinnamon
$\frac{1}{4}$ c. molasses	1 tbsp. lemon juice
3 tbsp. fat	A little grated lemon rind
$\frac{1}{2}$ tbsp. ginger	1 c. flour

$\frac{1}{8}$ tsp. soda

Roll as thin as possible.

C. MAKE CHOCOLATE DROP COOKIES.

2 squares chocolate	1 egg
$\frac{1}{2}$ c. fat	$1\frac{1}{2}$ c. flour
$\frac{1}{2}$ c. milk	$\frac{1}{2}$ tsp. soda
1 c. brown sugar	$\frac{1}{2}$ tsp. vanilla

1 c. nuts

Melt the chocolate and fat, add the milk, sugar, and egg, beaten slightly. Sift the soda and flour, and add

with the nuts to the first mixture. Drop from a teaspoon on to a greased tin and bake in a moderate oven until the cake, when pressed with a finger, springs back into place. These cookies may be frosted with white or chocolate frosting, or served as they are.

Yeast

It is interesting to know that, although fermentation has been recognized and practiced from very early times, nothing definite was known about the cause until Pasteur worked out the problem in the middle of the nineteenth century. The account of how he went to work to prove that yeast-cells really produced the changes and that they did not originate spontaneously, as was believed previously, is a fascinating story of scientific research.[1]

Yeast Plants

The manufacture of yeast for sale is one of the important industries. It is usually sold in our stores in two forms, in compressed or dried cakes, and looking at either we should never guess that this yeast is really composed of multitudes of tiny, slightly oval-shaped cells, each of which is really a separate plant. They are totally unlike any garden plant, for they have neither stems, roots, leaves, nor branches, and they are not even green. Nevertheless, they really are living plants, which need food, moisture, and a certain amount of heat to make them grow; but curiously enough, they do not need light like ordinary plants.

Yeast is cultivated by sowing some of these plants in a liquid material known as wort, which supplies them with the moisture and food needed. Wort may, for example,

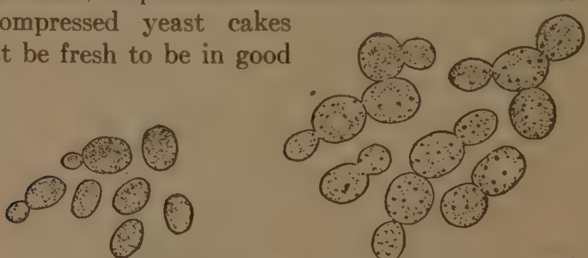
[1] "Life of Louis Pasteur", by Vallery-Radot.

be made of crushed grain or mashed potatoes, warm water, and sprouted barley. This liquid is then kept at the right temperature for yeast growth, and the plants soon begin to produce little buds such as are to be seen in some of the cells in the diagram. Later these buds, which are really new plants, form buds in their turn.

Compressed Yeast

The yeast which collects as a scum on top of the wort is preferred for bread yeast. To make compressed yeast cakes, the yeast in the scum is freed from impurities by being washed through sieves or stirred in water and allowed to settle, pressed to remove the water, and then cut into cakes which are wrapped in tinfoil. Starch may be mixed with the yeast before the pressing process takes place. A small percentage of starch helps to keep the yeast, especially in warm weather, as well as making it easier to mix with the flour in bread-making. As the amount of starch used varied from five to fifty per cent, the government recently has ruled that if starch is used in compressed yeast cakes, its presence must be stated on the label.

Compressed yeast cakes must be fresh to be in good



From Conn's "Bacteria, Yeasts, and Molds in the Home."

1. Yeast from a Dried Yeast Cake   2. The Same Yeast after a Few Hours' Growth

condition, and this can be told readily on examination. The cakes should be creamy white, not dark; uniform in

color, not streaked; a firm, even texture, not slimy; and there should be no disagreeable or cheesy odor.

Dried Yeast Cakes

Compressed yeast in good condition can usually be purchased in places of any size. In remote districts, however, it cannot always be obtained while it is sufficiently fresh for use. Such communities may use dried yeast cakes which are made from the same yeast as the compressed yeast cakes. After the yeast is mixed with starch or meal, it is partly dried in the sun or at a low temperature under pressure. Under these conditions some of the yeast cells die, while others pass into a resting stage. Thus the dried yeast is not so active as compressed yeast and it takes longer to start fermentation. Time must be allowed for dried yeast to become actively growing and multiplying.

"Home-made" Yeast

Some housekeepers "make yeast" at home by using commercial yeast to start the growth. This lessens the expense of bread-making and gives an active yeast which will raise bread much more rapidly when it is added to the dough than will dried yeast.

The following recipe may be used in making it.

Home-made Yeast.

4 potatoes	1 tsp. salt
1 qt. boiling water	4 tbsp. sugar

1 cake dried yeast

Pare the potatoes and cook them in the boiling water until soft, then mash them and stir them with the salt and sugar into the water used in cooking them. Add

enough water to make the mixture up to a quart, and when it is lukewarm mix in the yeast, first stirring it thoroughly with a small amount of the liquid. After the mixture has stood for twenty-four hours at room temperature (65°–70°), it is ready for use.

A quarter of a cup of liquid yeast may be used to take the place of a whole compressed yeast cake.

To keep this yeast for future use it should be placed in a sterilized jar and kept in a cool, dark place.

Salt-rising Bread

Wild yeasts are sometimes used in making the so-called salt-rising bread. Here, milk is mixed with a little flour and salt and set aside to ferment. The action is apparently not always due to the same cause. Sometimes wild yeasts are present, and at other times the action is entirely due to bacteria. Bread made in this way is much less uniform than that made with cultivated yeast.

Reference

Conn. "Bacteria, Yeasts, and Molds in the Home", section on Yeasts.

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. Compare the recipe for sugar cookies with the muffin recipe. What is the effect of the increase of fat and the addition of sugar? Why can cookies be rolled out without danger of toughening them?

2. Compare the recipe given for sugar cookies with one containing more fat, as, for example, Miss Farmer's recipe for rich cookies. What difference will you expect in the two kinds of cookies? Calculate the difference in cost.

3. Show what different flavors could be added to your recipes to make different varieties of cookies. Tell in each case how and when the new ingredient would be added.

4. What fats could be used in making sugar cookies? ginger snaps?

Home Work

Rolled cookies are more work to make than dropped cookies. Here is a recipe for sliced cookies which are easy to make.

Caramel Cookies.

1 c. brown sugar	$1\frac{3}{4}$ c. flour
$\frac{1}{4}$ c. butter, melted	$\frac{3}{4}$ tsp. cream of tartar
1 egg	$\frac{3}{4}$ tsp. soda

Roll the sugar if it is lumpy, then mix the butter and egg, beaten slightly. Sift the dry ingredients, combine the two mixtures, and make them into a roll, which should stand up for at least ten minutes. Then cut it in to thin slices and lay them on a greased baking tin. Bake in a moderate oven until brown on one side. Turn the cookies upside down to finish browning.

LVI

BREAD-MAKING

A. Make Bread.

1 tsp. fat (lard)	¼ to 2[1] yeast cakes
1 tsp. sugar	½ c. lukewarm water
½ tsp. salt	3 to 4 c. flour

1 c. boiling liquid (water, or milk and water)

1. Pour the liquid over the fat, sugar and salt and let stand until lukewarm (98°).
2. Stir the yeast thoroughly with the half-cup of lukewarm water and add to the first mixture.
3. Sift in gradually, stirring as you sift, as much flour as is needed to make a dough as soft as can be handled. Unless you are using a bread-mixer, you will find it easier to knead in the last of the flour instead of stirring it in.
4. On a floured board knead the dough thoroughly but lightly, until it is elastic and does not stick to the hands. Put the dough back into the mixing bowl and cover tightly (why?). The top of this dough may be brushed over lightly with fat (why?). Keep

[1] This large amount of yeast is added to enable the process of bread-making to be carried through in a very short time. For ordinary home use the proportions would be one yeast cake to a pint of liquid.

the dough at lukewarm temperature until it has doubled in bulk.

5. Knead again until the bubbles have been evenly distributed, adding no more flour than is necessary to keep the dough from sticking. Shape into two loaves (see *B*).
6. Place the loaves in greased tins, cover, and let rise until each loaf has doubled in size. Place in an oven at 450° F. for ten minutes, and finish baking at 365° to 385° F.

BREAD-MIXER

B. BISCUIT FROM BREAD DOUGH.

Make biscuit from bread dough by shaping some of the dough into biscuit and letting them double in bulk before baking. The best temperature for baking rolls is 435°. If desired, a little extra fat may be kneaded into the biscuit before they are shaped.

BREAD-MAKING

Bread is made in two ways, and is known as short- and long-process bread. The method of making short-process bread is the more modern. This method became possible only with the availability of fresh yeast, such as is found in compressed yeast cakes.

Short-process Bread

In short-process bread-making, the yeast is stirred with lukewarm water and mixed with sufficient flour and warm water to obtain a dough of desired consistency. The combination may be made by stirring the water into the flour, or vice-versa. If fat is to be used, it is melted by pouring hot water over it and then allowed to cool to the proper temperature. The yeast is stirred with water to separate it, so that it can be mixed more readily with the other ingredients. It must not be mixed with the liquid while it is too hot, or the yeast will be killed. Yeast plants cannot stand a temperature of 130° F. But water should be warm, about 90° F., in order to hasten the growth of the yeast. This is desirable, because less time is given for the development of bacteria which may cause the dough to become sour. In order to maintain the suitable temperature after mixing, the dough is covered to prevent its cooling and also drying. The flour furnishes both protein and starch as food for the yeast plants. Pure yeast cannot act directly on starch.

Effect of Yeast

Flour contains diastase, an enzyme not unlike the ptyalin found in saliva, which is capable of changing the starch into sugar. As soon as sugar is produced, the yeast begins to act upon it by means of the ferments which it contains. These break up the sugar present into carbon dioxide and alcohol. The carbon dioxide is a gas which cannot escape easily through the dough, since the gluten present holds it, much as the soap in soapsuds holds air when one blows into it.

Effect of Kneading

Gluten in flour is developed by kneading, since this mixes water with the glutenin and gliadin, two of the proteins found in flour. Many people have an idea that bread must be kneaded with great force, but this is a mistake. The more lightly the dough is handled, the better the texture of the bread. As little flour as possible should be used, but, of course, enough must be added to enable the dough to be handled without sticking to the board or the fingers. Experience makes it possible to handle a very soft dough, and this is probably one of the ways in which skill counts in bread-making.

Reason for Second Kneading

As the yeast grows and produces carbon dioxide, the dough is stretched by the gas until it is full of bubbles, and "rises." The action is allowed to go on, until the dough has doubled in bulk. At this stage, it could be baked, but it would give a bread of very uneven texture, for, with all the care in mixing, the bubbles of gas are unevenly distributed and some are very large. So, instead of being baked, the dough is kneaded again, this time to break up the larger bubbles and to distribute the gas as evenly as possible. Then the dough is shaped into loaves. It is again set in a warm place for the yeast to produce more gas, since some was lost in the kneading process. When the dough has doubled in bulk, it is ready for baking.

Effect of Various Ingredients

The essential ingredients in bread-making are flour, liquid, salt, and yeast. Fat is commonly added because the bread is "shorter", as it is called — that is, less tough.

Sugar is added to hasten the starting of the yeast, as well as to make the bread more tender. Potatoes and potato water also seem to stimulate the yeast to quicker action, and to make the bread less dry after it is baked. Milk may be used, or the liquid may be part or all water. Milk adds some fat as well as a little more food value to the bread and changes its flavor somewhat. If milk is used, it is first scalded to kill some of the bacteria present. There is always danger of the dough souring, because the yeast itself is not free from bacteria, and some kinds of bacteria act on the alcohol and produce acids which make the bread sour. For this reason we like to have the dough rise quickly. In a short-process bread, there is less danger of sour dough, because the yeast usually acts too quickly to give the bacteria time to multiply sufficiently to produce enough acid to sour the dough.

The length of time necessary to make bread by the short process depends upon the amount of yeast used. If the first rising is to be over night, usually from one-fourth to one-half of a yeast cake is used for each pint of liquid. To shorten the time of rising, the amount of yeast can be increased almost indefinitely. Even as many as five or six cakes of yeast can be used and, if they are perfectly fresh, they will not give a disagreeable flavor to the bread. But since they increase the cost of the bread unduly, usually not more than a cake to a quart of liquid is used.

Method of Keeping the Dough

Since neither yeast nor bacteria grow well in the cold, it is possible to check the rising of the dough by placing it in an ice-chest or some other cold place. This is sometimes done in order to keep the dough so that hot biscuits may be served at a special time.

Long-process Bread

Long-process bread is made by setting a sponge. This means that in the first mixing only about half the flour is used. The sponge, as it is called, is really a batter. This is allowed to stand until it is very light and foamy. Then the rest of the flour is mixed with it and the dough is then treated as if this were the first mixing in short-process bread. The advantage of this way of making bread is that dry yeast can be used, for the rising of the sponge gives time for it to become actively-growing yeast. Some cooks set a sponge when using compressed yeast, but there is no necessity for doing so, and as the long process means more work than the short process, the latter method should be preferred.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. What will happen in bread-mixing:
   (*a*) if the weather is too warm?
   (*b*) if, in very cold water, the flour is not warmed?
   (*c*) if the bread is put to rise in too warm a place?
   (*d*) if the bread is put to rise in too cold a place?
   (*e*) if the bread is insufficiently kneaded before shaping into loaves?
   (*f*) if the bread is kneaded too heavily?
   (*g*) if too much flour is used?
2. What may happen if the liquid is not scalded?
3. When is it advantageous to use a bread-mixer?
4. Why is a different temperature required in baking bread and rolls?

Home Work

1. It requires some skill to become a good bread-maker, but if one understands the process thoroughly, all that is necessary is a little practice to acquire this skill. Make

bread repeatedly until you are certain that you can be sure of the product.

2. While many busy housewives cannot find time to make their bread regularly, everyone seems to prefer home-made bread, if it is good, to even the best bakery bread. One can usually sell at a good price any amount one cares to make. Compare the cost of a loaf of home-made bread with that of a bakery loaf of the same weight and, if possible, with the price asked for a "home-made" loaf at some Woman's Exchange.

LVII

BREAD

ROLLS
GRAHAM AND OATMEAL BREAD

A. **Class Work.** PARKER HOUSE ROLLS.

Make Parker House rolls by the long-process method of making bread.

2 c. scalded milk	1½ tsp. salt
3 tbsp. butter	1 yeast cake
2 tbsp. sugar	3 c. flour to make sponge

About 3 c. flour to make dough

PARKER HOUSE ROLLS

When ready to form rolls, divide the dough into small pieces and shape into Parker House rolls, tea biscuits, finger rolls, cinnamon rolls, and the like. See cook books for directions.

B. Make Graham or Oatmeal Bread.

Follow the short process of making bread.

Graham Bread.

1 c. liquid { $\frac{1}{2}$ c. milk / $\frac{1}{2}$ c. water (3 tbsp. may be potato water) }
1 yeast cake (?)[1]
$1\frac{1}{4}$ c. white flour
$1\frac{3}{4}$ c. graham flour
1 tsp. salt
2 tbsp brown sugar, or $\frac{1}{4}$ c. molasses

Oatmeal Bread.

Pour two cups of boiling water over one cup of rolled oats.

Add 4 tbsp. brown sugar, or $\frac{1}{2}$ c. molasses
2 tbsp. fat
1 tsp. salt
1 yeast cake (?)[1]
Flour to make a stiff dough, about $4\frac{1}{2}$ c.

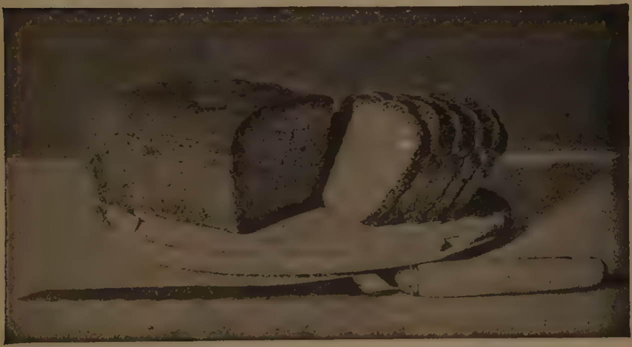
Bread

Effect of Baking Bread

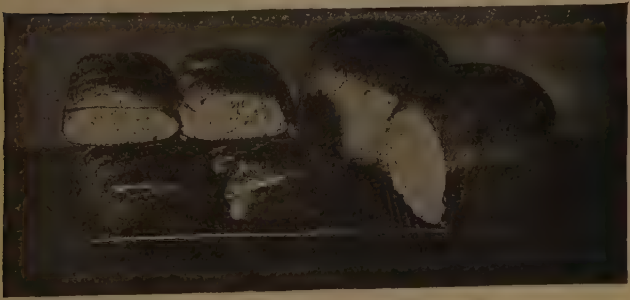
When bread has risen sufficiently, it is placed in a hot oven at about 450° F. Baking the dough accomplishes a number of things. It kills the yeast plants so that fermentation stops; it also kills any bacteria which may be present; it expands the carbon dioxide gas so that the loaf is larger after than before baking; it vaporizes the alcohol and drives it off; it hardens the gluten so that the bread, once risen, will keep its shape and will not fall

[1] Amount depends on time to be given to rising.

Bread and Rolls Made with One Yeast Cake



Graham Bread Made without Kneading



Loaf of Bread and Parker House Rolls

From "Cooking for Two", by Janet McKenzie Hill.

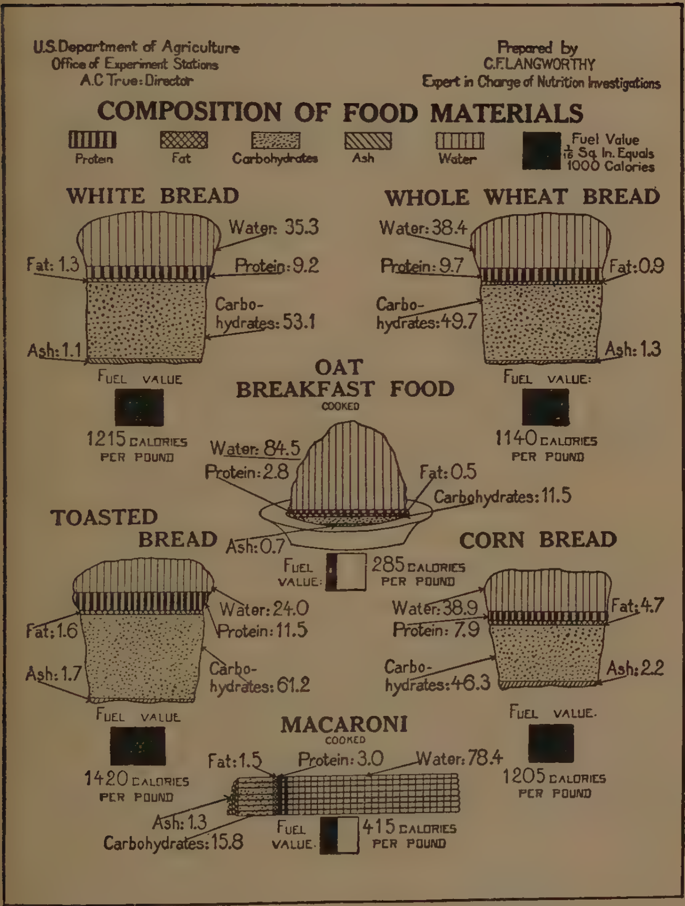
when it cools; and, finally, it causes the starch on the inside of the loaf to take up water and become hydrated, while it dextrinizes some of the starch in the crust.

As these are all essential processes, it is important to be sure that the bread is so thoroughly baked as to effect all these results. In bread which is insufficiently baked all the organisms which are present may not be killed, and it may grow sour as it is kept. Bread is sufficiently baked when tapping the top and bottom of the loaf produces hollow sounds. Since long baking is so desirable, many people lower the heat after the bread is well baked, and leave the loaves in the oven for a long time.

Bread-making is, perhaps, one of the most common subjects for cooking contests because, if one is to count on always turning out excellent results, considerable skill is required, as well as knowledge of the reasons for all the steps. The requirements for a perfect loaf are shown by the score cards used in judging such contests. The following is from "Baking in the Home."

Score Card for Bread

1. General appearance:	
Shape	5
Smoothness of crust	5
Depth and evenness of crust	5
2. Lightness	10
3. Crust:	
Thickness	5
Quality (crispness and elasticity)	5
4. Crumb:	
Color	10
Texture (size and uniformity of cells, thinness of cell walls)	15
Elasticity (softness and springiness)	10
5. Flavor:	
Taste and odor	30
Total	100



COMPOSITION OF BREAD AND OTHER CEREAL PRODUCTS

Comparison of Home-made and Bakery Bread

Bakers' bread is usually much lighter than home-made bread, a slice of given dimensions weighing about half as much as a slice of home-made bread of the same size. It is, of course, slice for slice, just about half as nutritious, and we usually eat more of the bakers' bread to satisfy our appetites. This does not condemn bakers' bread as a food, but the fact remains that this must be taken into consideration in comparing the cost of purchased with that of home-made bread. The demand for the ready-made product is becoming so great that usually a fairly well-made bread can be purchased almost anywhere and the average quality is probably better than the average home-made product, for many housewives make bread much below the standard.

Yeast versus Baking-powder Bread

Since yeast leaves no such questionable residues in the bread as baking powder does, the constant use of yeast bread is supposed to be preferable to that of baking-powder breads, but the bad effects of the too continued use of the latter may be partly the result of the habit of eating such breads hot instead of cold. Freshly baked bread is less digestible, because of the difficulty of mastication. Such bread unless well baked, tends to roll up into a pasty mass instead of breaking up as a cracker does when it is chewed.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. When would you prefer to make a long-process bread?
2. Why should bread not be put away while it is still warm?

3. Why is bread stored in a bread-box?

4. Why should cake and bread be kept in separate boxes?

5. Compare the weight and price of home-made and bakers' loaves of bread.

6. Compare the cost per loaf, if short-process bread is set over night, or is made in two hours.

7. Compare the cost of making bread with compressed yeast set over night, and with dried yeast used in long-process bread.

8. What is "potato yeast"? How is it made and used?

9. How would you make whole-wheat bread? rye bread?

10. Why is some white flour used in making such breads as graham, rye, and oatmeal?

Home Work

1. When one understands the process of making one kind of yeast bread and has acquired the necessary skill, it is very easy to learn to make other kinds of yeast bread also. The same may also be said for baking-powder breads. See what different recipes you can find to try.

2. Here is an excellent recipe for Coffee Bread.

Coffee Bread.

1 tbsp. fat	1 c. flour
$\frac{1}{4}$ c. sugar	2 tsp. baking powder
1 egg	$\frac{1}{2}$ tsp. salt
$\frac{1}{3}$ c. milk	1 tbsp. sugar and $\frac{1}{4}$ tsp. cinnamon

Melt the fat and add it to the sugar, then the egg, beaten slightly, next the milk, and finally the flour, baking powder, and salt, sifted together. Spread in a thin layer in a baking pan, sprinkle with the cinnamon and sugar, and bake about twenty minutes in a moderate oven.

3. Arrange a contest: each girl to make a loaf of yeast bread at home; the class to judge results, using the score card for the best five loaves.

LVIII

PASTRY

Apple Pie
Chocolate Cream Pie

A. **Class Experiments.** Correct Proportions of Fat and Liquid to Flour.

I. (*a*) Mix a teaspoon of lard and four teaspoons of flour into a small cake and bake.

(*b*) Repeat, using butter instead of lard.

Compare results.

II. To Explain One Difference between Lard and Butter.

Melt over hot water one ounce butter and one ounce lard. Let stand and notice any differences. How would you substitute one for the other?

III. To Test Effect of Water.

(*a*) Repeat I (*a*), but add to each a carefully measured amount of water, the least possible necessary to make the mixture hold together. How much is used?

(*b*) Repeat, using twice as much water.

(*c*) Repeat, using three times as much water.

Write a recipe with directions for making pie crust.

B. PREPARE PIE CRUST.

Use either:
1. All oleo.
2. All lard.
3. Half lard and half butter.
4. All Crisco.
5. Half lard and half oleo.

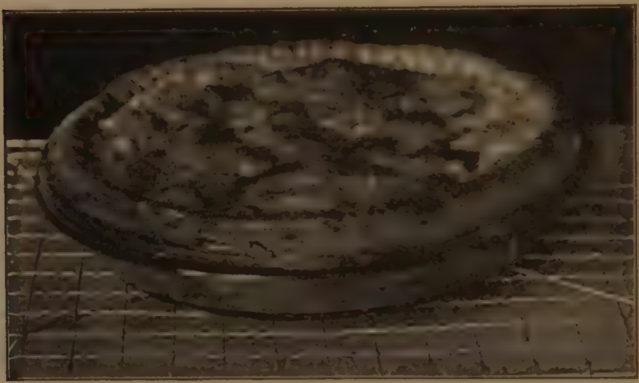
What proportion of fat will you use in each case? How will the amount of salt vary with the amount of fat used? Roll out crust.

1. Cover the bottom of a small inverted pie-plate with very thin crust. Prick with fork. Bake in a hot oven for a few minutes. Slip the crust into the inside of the plate and finish baking.
2. Cover the inside of the plate with crust. Do not prick. Bake as before. Compare with (1) for use as a shell for pie. Explain the behavior of (2).
3. Bake a piece of the crust trimmings in a very slow oven. Decide upon the best temperature for baking pastry shells.

C. PREPARE AN APPLE PIE.

Slice four or five apples. Cover the bottom of a pie tin with crust, trimming off the edge by running a knife around the edge of the tin. Pile the slices of apple a little higher toward the center, and sprinkle with from two to five tablespoons of sugar. Moisten the edge of the lower crust with water, put the upper crust, with a few slits cut in it to let out the steam, over the lower crust, pressing down the edge firmly; then trim off the surplus crust as before, or roll it under the lower edge and press it down with the prongs of a fork.

Bake until the apples are soft and the crust is brown — about forty minutes.



APPLE PIE WITH SLITS CUT IN UPPER CRUST

Spice may be added to the apples; also a little butter; or, if the apples are not juicy, two or three tablespoons of water.

PASTRY

Pastry Flour

Pastry flour differs from bread flour in having a smaller amount of gluten and a larger amount of starch. The advantage in using it for pastry and for cake is that, so made, they are more tender than when made with the larger amount of gluten. It is quite possible, however, to make both good pastry and good cake with ordinary bread flour. If bread flour be used, greater care should be taken not to develop the gluten by too much working. This is just the opposite of what we try to do in making bread.

Pastry flour is made in two ways. It is sometimes made by grinding soft wheat; sometimes by selecting the flour stream from the grinding of hard wheat, which will furnish the largest percentage of starch. The housekeeper may get much the same effect by adding cornstarch to bread flour, using three parts of flour to one part of cornstarch. The flour sold in bulk as pastry flour is sometimes unsatisfactory, being in reality only a poorer grade of flour and one not adapted especially to pie- and cake-making. Pastry flour is distinguished from bread flour by its whiter color, its smoother and less gritty quality, and by retaining better the print of the fingers, if squeezed in the hand.

Leavening

Since no leavening agent is ordinarily used in pie crust, careful handling is necessary to entangle air in the dough so that the heat of the oven shall expand it and produce a light crust. This is accomplished by the many foldings of the dough after it is first rolled out. This folding makes many horizontal layers which in a light, baked crust are separated somewhat from each other. The large amount of fat undoubtedly helps in the power of these layers to retain gas which may be partly the air, as already mentioned, as well as vapor from the water in the dough. Moisture undoubtedly plays a larger part in leavening pastry than it does in bread, because here the thin layer of crust is heated more quickly to a much higher temperature than that of the inside of a loaf of bread.

Effect of the Fat Used

Fat in pie crust makes it short and flaky. Different fats are used, butter, oleomargarine, lard, Crisco, cottolene, and the like. Butter usually gives the best flavor, but it is most expensive. Sometimes part butter is used.

Digestibility of Pastry

Pie crust is not generally considered very digestible, due to a number of reasons. The lower crust, if wet and soggy and underdone, forms a soft mass which is rarely properly mixed with saliva in chewing. Well-baked pie crust which is flaky and crisp undoubtedly breaks up better and so is more digestible. Overheated fat is not easily digested and, for some people, this may be a source of difficulty, but the large amount of fat present is more likely to be one of the difficulties. Pies are usually very hearty, supplying many calories. If eaten after a generous meal, one is quite likely to be over eating. Then, so little liquid is used with the flour that, often, part of the starch is not hydrated at all, so that even after baking, it is not really changed from raw starch. But it is easy to see that the really light and flaky crust is the most desirable from the standpoint of digestibility, as well as from that of taste.

Reference

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1136. "Baking in the Home."

Questions

1. What effect does water have on flour?
2. What effect has fat?
3. How are crusts of a two-crust pie held together?
4. Is there a difference in the oven temperature for pies filled with cooked and uncooked mixtures? Why?
5. Compare butter, Crisco, and lard as shortening in pastry.
6. What effect has temperature during mixing and before baking on the resulting pie crust? Why is this?
7. Why is pie crust difficult to digest?
8. Why is it necessary to perforate crust for single-crust pie?
9. Is it necessary to butter a pie-tin?
10. Can unbaked pastry be kept over from one day to the next? How?

Home Work

If you are making a custard pie, or one with a soft filling and just a lower crust, it is wise to turn the pie plate upside down, dust it over with flour, and spread the crust on it. Bake five minutes, then slip off and put it into the pie plate and pour in the filling. Try that method in the following recipe.

Chocolate Cream Pie.

2 c. milk	2 squares chocolate
$\frac{1}{4}$ tsp. salt	2 egg yolks, beaten slightly
$\frac{1}{2}$ c. sugar	1 tsp. vanilla
4 tbsp. cornstarch	2 egg whites with 2 tbsp. sugar

Mix the cornstarch, sugar, and salt with the milk, add the chocolate and egg yolks, and, stirring constantly, heat until the mixture is quite thick. Add vanilla and pour into crust (see above). Put in hot oven until filling just bubbles, then spread over it the egg whites, beaten stiff and mixed with sugar. Return to oven until meringue is delicately brown on top.

LIX

FATS

DOUGHNUTS
CLARIFYING AND TRYING-OUT FAT
SAUTÉED POTATOES

A. **Class Experiments.** FATS.

1. Examine the following fats: butter, oleomargarine, lard, cottonseed oil, olive oil, beef fat, Crisco, and Snowdrift. Note the differences in color and odor.
2. Find the temperatures at which butter, lard, and Crisco melt. Place two tablespoons of each fat in small beakers, stand in warm water, insert a thermometer, and note the temperature at which the fat melts.
3. Put drops of olive oil and oil of peppermint on a piece of paper and warm them. How do they differ?
4. To determine the "cracking-" or "burning-point" of fats:
   a. Test butter with blue litmus paper; then place about two teaspoons of butter in a small evaporating dish and heat until the first appearance of smoke. Determine the temperature of the fat. Hold a piece of moist litmus paper in the fumes.

b. Repeat with lard, olive oil, and Crisco. In which fats would it be best to fry?

5. Heat fat, lard, or Crisco to 355° F., and then determine in how many seconds a small piece of bread will brown in the fat. Repeat with the fat at 365° F., and at 385° F. What is the effect on the bread at the low temperature? Of the last two temperatures, which would be better for frying uncooked material like fritters? Material already cooked, such as croquettes?

B. Make Doughnuts.

Use the following recipe:

1 c. milk	2 tsp. salt
2 tbsp. butter	4 eggs
1 c. sugar	4 c. flour
4 tsp. baking powder	1 tsp. cinnamon
$\frac{1}{4}$ tsp. nutmeg	

C. Clarify the Fat Used.

Heat the fat slowly with a few slices of raw potatoes; then strain through cheesecloth placed in a strainer.

Fats

Fat, a term which is used to include edible oils as well as harder fat, is, like carbohydrate, a source of energy in the body.

Food Value of Fats

Weight for weight, fats furnish the body with two and a quarter as much energy as do the carbohydrates. But not all substances which are ordinarily spoken of as fats are really pure fat. Olive oil and lard are practically pure fat, but butter contains only from eighty to eighty-

five per cent of it, the rest being mostly water, curd, and mineral matter. This difference is plainly seen when samples of butter and lard are melted and compared.

Comparative Digestibility of Fats

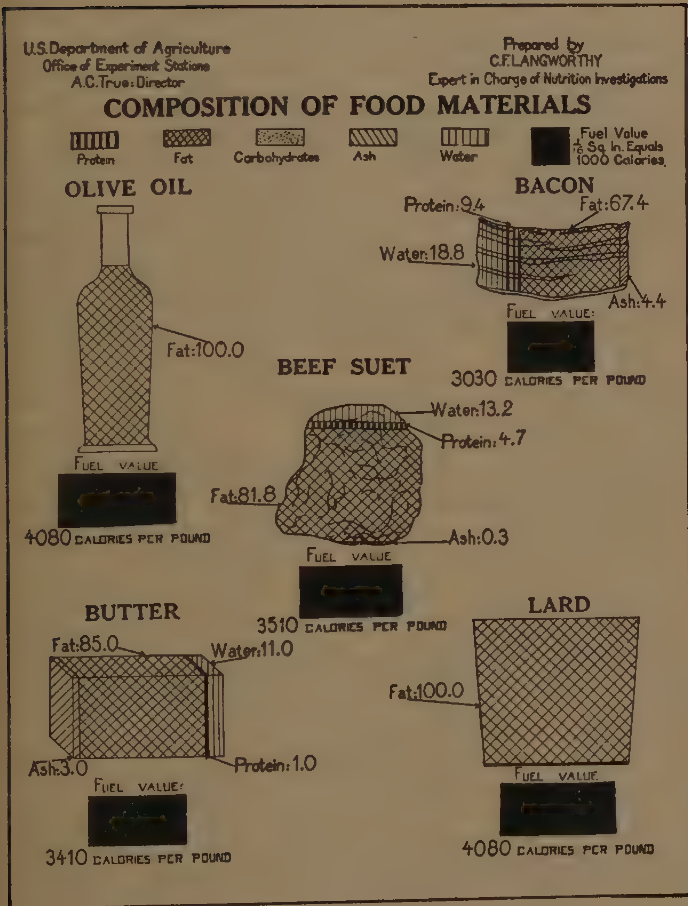
Fats practically do not differ in the extent to which they are ordinarily digested, provided that the temperature at which they melt is below 110° F. Apparently fats whose melting point is higher than this do not become sufficiently melted to be easily emulsified and digested in the intestine. Stearin, for example, has a high melting point and, when eaten as such, most of it is not digested. If, however, the stearin is mixed with enough of a liquid fat like olein, so that the mixture has a melting point that is below 110°, it will be absorbed as well as any other fat. This fact is of importance when we use oleomargarine, which, although it contains more stearin than butter, is just as completely digested as butter.

The melting point of some of the common fats is shown in the following table:

Stearin	140° F.	Lard	86–102°
Mutton fat	116.5–123°	Butter	83–95°
Palmitin	113°	Olein	Fluid
Beef fat	107.5–122°	Olive oil	Fluid
Bacon fat	103°	Cottonseed oil	Fluid

Effect of Fat in the Diet

The presence of fat in our food retards the flow of gastric juice and tends to make the food stay longer in the stomach; and apparently the higher the melting point of the fat eaten, the more effect it has in slowing stomach digestion. However, this effect in moderation is not objectionable. During the World War, in those countries where there was serious difficulty in obtaining fat, the lack



Composition of Foods Containing Much Fat

of it seemed to cause severe hunger even when the food eaten supplied sufficient calories.

Fat itself is not likely to undergo objectionable decomposition during digestion, nor to cause discomfort in digestion, unless it has been heated to so high a temperature in cooking that part of it has formed decomposition products that are irritating. If you recall how the fumes from overheated fat irritate your eyes and nose, you will readily see that they might be irritating to the lining of the digestive tract. Therefore in frying it is wise to consider the temperatures at which this decomposition takes place. The following is a table of "cracking-points", as the decomposition temperatures are often called: —

Crisco	896° F.	Lard	419–475°
Olive oil	608–680°	Butter	365–428°
Cottolene	450°		

Since fat is not digested until it reaches the intestine, we can easily see that food that is soaked in grease may not be readily digested because the coating of fat around the other material may prevent the saliva and gastric juice from coming in contact with it. For this reason the constant eating of fried food is considered objectionable, and all frying should be carried on so as to soak up as little of the fat as possible.

Fat and Vitamin

One of the vitamins especially needed for growth and health is so commonly found associated with fat that it has received the name "fat-soluble" vitamin, otherwise known as Vitamin A. But it is now known that fats vary very much in the amount of this substance they contain, some having none at all. Butter usually contains a large amount of it, although the amount present varies, per-

haps with the food of the cow, as well as the breed, and with the manner in which the butter is made and kept. Eggs, too, contain large amounts of this vitamin, which is in the yolk, the latter being one-third fat. Look in the Table of Vitamins in the Appendix and note which foods supply large amounts of this vitamin.

There is also a vitamin present in cod-liver oil, and sometimes (in much smaller amounts) in milk, butter, and egg yolk, which prevents the disease of the bones known as rickets, the disease from which bow-legged children and those with pigeon breast are probably suffering. But since this vitamin can be formed directly by exposing fats to certain kinds of light, it follows that if we have enough sunlight on our skins this vitamin can be formed directly in our bodies and then does not have to be taken as a part of our needed food. The sunshine must not come through glass, however, if it is to be effective. This vitamin formation is one of the benefits of outdoor life.

Cost of Fat

Fats vary greatly in cost, olive oil being expensive. Advantage should be taken of the lower price asked for it in quantity. (Buying oil in a small bottle is very extravagant.) Italian oil in bulk is usually cheaper than French oil. Good American oil is manufactured in California.

Butter and cream are also expensive sources of fat, but they are especially desirable for children and invalids on account of their ease of digestion, as well as their Vitamin A content. Bacon fat ranks with butter and cream both in digestibility and expense. Fat left from the frying of bacon should be carefully saved for sautéing, as should that tried out from the fat of beef, veal, pork, and

chicken. Even the fat which hardens on soup stock can be used. Gravies, sauces, cream soups, and gingerbread may all be made with such fat, and vegetables and meat may be sautéed in them. Mutton fat[1] has so strong a flavor that it is less commonly used for cooking.

References

U. S. Dept. of Agriculture.

Bulletin No. 310. "Digestibility of Some Animal Fats."

Bulletin No. 507. "Studies in the Digestibility of Some Animal Fats."

Bulletin No. 505. "Digestibility of Some Vegetable Fats."

Bulletin No. 469. "Fats and Their Economical Use in the Home."

Questions

1. Discuss the digestibility of fats.
2. What care must be taken in frying food to make it as digestible as possible?
3. Why is fat-soaked food indigestible?
4. What is the difference between sautéing and frying?
5. Why does the cooking of slices of raw potato in fat clarify it?
6. Why is deep-fat frying dangerous, especially over an open flame?
7. Why should fried foods be drained on unglazed paper?
8. Why should foods to be fried be as dry as possible?

Home Work

1. What is the source of the following fats and what does each cost per pound: butter, lard, cottonseed oil, olive oil, beef fat, Crisco? Are fats sufficiently expensive food so that it is worth while to consider economy in their use? Suggest good opportunities for the substitution of a cheaper fat for a more expensive one. For ex-

[1] For ways of utilizing this fat, see U. S. Dept. of Agriculture Bulletin No. 310, page 11.

ample, would it be better to use lard in ginger snaps or sugar cookies?

2. Sauté some left-over potatoes.

Sautéed Potatoes.

Slice or chop boiled or baked potatoes (without the skin). Put about two tablespoons of fat — preferably bacon fat or tried-out beef fat — in a frying pan, and when it is hot, add the potatoes sprinkled with salt. Cook until brown, stirring them occasionally to keep them from burning and to brown them on all sides.

To Try Out Beef Fat.

Cut the fat into small pieces (put through a meat grinder if possible), removing the tough outside skin. Put in a double boiler and let the fat melt. Pour this off from time to time, straining if necessary. Heat until no further fat can be pressed out with a fork.

Fat may be put in a dish to melt in a slow oven, but it requires watching to see that it does not get too brown.

LX

MILK FATS

BUTTER
WHIPPED-CREAM DESSERTS
PHILADELPHIA ICE CREAMS

A. **Class Experiments.** CREAM AND BUTTER.

1. Examine a drop of cream under the microscope. Note the globules of fat. Compare with drops of whole and of skimmed milk examined in the same way.
2. Chill a portion of cream and whip[1] until stiff. Reserve and finish as whipped-cream pudding. Warm another portion and whip as above. Explain the difference in the result.
3. To make butter.
   Shake a weighed and measured amount of ripened cream in a preserve jar, until the fat separates. Add ice. Collect the lumps into a mass and plunge them into ice water and work out all the buttermilk. Weigh. Add salt in the proportion of one-half ounce to every pound of butter. Compute the cost of this butter and compare it with the market price.

[1] The efficiency of different cream whippers may be tried out. Some will whip the cream from the top of an ordinary milk bottle.

A WHIPPED-CREAM PUDDING
(Charlotte Russe)

B. PREPARE WHIPPED-CREAM PUDDING.

Beat into whipped cream, crumbs rolled from dried macaroons, or from ginger snaps, or dried cake, or stir in dates or figs cut in small pieces. Sweeten and flavor as desired. Candied cherries may be used as decorations.

C. PREPARE PHILADELPHIA ICE CREAM.

VANILLA ICE CREAM

1 qt. cream   ½ c. sugar
1 tbsp. vanilla

Add flavoring and sweetening to cream and freeze, stirring. For proportions of ice and salt, see earlier lesson.

VARIATIONS

If desired, one-half cup stale macaroon crumbs may be added to the vanilla cream before freezing. For chocolate ice cream melt two squares of chocolate, mix it with one-

third of a cup of boiling water, and add the cream and three-quarters of a cup of sugar. For fruit ice cream, add fresh fruit, crushed or after it has stood mixed with sugar, and omit the vanilla. Sweeten to taste.

Butter

It is curious to think that butter, now considered such an indispensable article of diet, was not used at all in ancient times. Even the butter used in the Middle Ages is said to have been semi-liquid and a very inferior article. In modern times butter-making has been a household industry until very recently.

Butter-making

In this country the first creamery — as butter factories are called — was probably opened in 1861. So many men were away from the farms during the war between the North and South that the women were too busy to carry on all the household labors, and this gave impetus to a number of such industries. Some of them were, and still are, coöperative undertakings, owned by the farmers themselves. Sometimes the milk itself is sent to the creamery, in other cases only the cream. The milk or cream, as the case may be, is usually tested and paid for on the basis of the fat content.

It is becoming a more and more common practice to pasteurize the cream to be used in making butter. This kills any disease-producing germs, as well as most of the others, and gives a more uniform product and one which keeps well. After pasteurization the ripening is accomplished by the addition of skimmed milk which is in a state of active fermentation. The mixture is kept at about 70° F. until it forms a smooth curd; then it is colored and churned.

It is interesting to note, so accustomed are we to colored butter, that while the coloring of most foods is forbidden unless so labeled, the coloring of butter is permitted.

The washing of the butter after churning is an important part of the process; carelessness means the failure to remove enough of the buttermilk, which gives a streaked butter of poor keeping qualities. Butter made on the farm often fails to be good because of insufficient working. Salting not only gives flavor, but helps in the keeping of the butter, partly by aiding the removal of the buttermilk. The amount of moisture in butter varies, but more than sixteen per cent is usually illegal.

Rancid Butter

Butter which is kept too long becomes rancid, that is, of poor flavor and odor. This rancidity may be from two causes, the more common of which is not the decomposition of the fat, but the spoiling of the protein present in the curd. Renovated or process butter is butter which has been reworked after becoming more or less rancid. The butter fat is removed from the rest by melting, and air is blown through to remove any bad odor; then it is mixed with fresh cream or milk, and churned. Some States restrict the sale of this butter, although they permit the sale of poor butter.

Many housewives seem to be ignorant of the fact that poor tasting butter can be renovated fairly well at home by merely working the butter so as to wash it thoroughly, in a succession of bowls of cold water.

Buttermilk

Buttermilk may contain not more than 0.2 per cent of fat, whereas normal milk contains about four per cent.

This makes it evident that buttermilk is less hearty than whole milk, although there is a common belief that the contrary is true. Such milk is valued not only for its flavor and perhaps for its increased digestibility, but also for the lactic acid bacteria present. Some authorities hold that these bacteria are carried into the small intestine and keep in check the growth of those bacteria which cause putrefaction. Much of the milk sold as buttermilk is really fermented skimmed milk containing perhaps only 0.1 per cent of fat. The greater digestibility of fermented milk seems to lie in the finely divided condition of the protein.

Oleomargarine

Oleomargarine, also called merely margarine, has been used in this country for about fifty years. It was originally made in France, where it was called by the latter name. In this country, however, it is perhaps more legally known by its longer name, and popularly called oleo. This latter is not a very accurate title, however, because all margarine does not even contain oleo, which is really a rather liquid beef fat.

Manufacture of Oleomargarine

Oleomargarine is made by churning other-than-butter fats with milk, or milk and butter, or milk and cream. In one type of margarine both animal and vegetable fats are used. The animal fats are usually soft beef fat, called "oleo oil", and neutral lard, which are mixed with cottonseed oil or some other vegetable fat. A second type of oleomargarine is made from such vegetable fats as cocoanut, peanut, and cottonseed oils, and contains no oleo oil at all, although by our Federal law it must still be stamped oleomargarine.

All oleomargarine is made under government supervision, which insures a clean, wholesome product. Not only are the animal fats used in the manufacture inspected, but the whole establishment must conform to sanitary requirements, and even the butter as well as the milk used must be pasteurized.

Oleomargarine that is artificially colored yellow is taxed ten cents a pound, which makes the price too high for it to be able to compete with butter. Uncolored margarine is taxed only a quarter of a cent a pound. The reason for the high tax on the colored article is presumably to prevent its being fraudulently sold as butter.

As many people object to "colorless butter"— butter itself has yellow coloring added to it during most of the year — the manufacturers supply the coloring matter, which they are not allowed to put into their product, in a small capsule usually spoken of as a "bean." This the purchaser may mix into the margarine if he wishes.

Margarine which is naturally yellowish is also manufactured. This color is obtained by using fats that are naturally yellow. Some states, however, have laws forbidding the sale of yellow margarine whether the color is natural or artificial — not, however, because this oleomargarine is in any way objectionable.

Comparison of Butter and Margarine

While many people cannot distinguish the difference in flavor between oleomargarine and butter, especially for any use except with bread, it still seems uncertain whether margarine contains the liberal amount of fat-soluble vitamin found in most butter. Quantitative work on vitamins has only recently been begun, and many problems in regard to them are still to be solved. Facts along these lines are being so rapidly discovered, however, that any

book statements in regard to our limitation of knowledge in respect to them is likely to be immediately out of date. In any case, if our diet supplies us with enough of the fat-soluble vitamin because it includes a liberal amount of whole milk or foods which, like spinach, are rich in this vitamin, there can be no dietary objection on this score to the use of margarine instead of butter.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1075. "The Whipping Quality of Cream." Institute of Margarine Manufacturers, Washington, D. C. Free literature on the subject of oleomargarine.

Questions

1. In what form is the fat in milk?
2. Why does fat sold as cream command a higher price than the same sold as butter?
3. What is the difference between creamery and dairy butter? What is "country butter"?
4. What is the average percentage of fat in butter? in coffee cream? in whipping cream?
5. What is rancid butter?
6. When butter shows whitish streaks through it, what is the cause?
7. Why does whipped cream usually sour more quickly than ordinary cream?

Home Work

1. What different butters are sold in your stores and how do the prices vary at the present time? Compare with the cost of oleomargarine. What are the variations in price of butter in your stores during the year? What causes the variation?

2. Cream that is whipped will serve more people than the same cream would serve if it were left plain. However, cream must be fairly thick before it will whip. Often

one can whip the top of a bottle of milk if it is carefully skimmed after it has been allowed to stand for a day. One can purchase solutions to add to this cream to help make it whip. These solutions are fairly satisfactory, but one has to be careful not to add too much of them or the flavor of the cream will be changed. Try fresh gingerbread baked in muffin tins or cut in squares and served with whipped cream for dessert. Very plain cake may also be used in this way.

LXI

MILK

CUSTARDS
CUSTARD ICE CREAM
FLOATING ISLAND

A. PREPARE SOFT CUSTARD.

Use the following proportions:

	EGG	MILK	SUGAR	FLAVORING
1.	½	1 c.	1 tbsp.	¼ tsp. vanilla and a few grains of salt
2.	1	1 c.	1 tbsp.	1 tsp. vanilla and a few grains of salt
3.	2	1 c.	1 tbsp.	¼ tsp. vanilla and a few grains of salt

Beat the egg slightly, add milk and sugar, and cook over hot water, stirring carefully until the custard coats the spoon. Flavor and cool. Compare the various consistencies obtained. Which is best?

B. PREPARE BAKED CUSTARDS.

Use the following proportions, and the amount of egg determined in A.

	Egg	Milk	Sugar	Flavoring
1.	?	1 c.	1 tbsp.	as preferred
2.	?	1 c.	$1\frac{1}{2}$ tbsp.	as preferred
3.	?	1 c.	3 tbsp.	as preferred
4.	?	1 c.	$1\frac{1}{2}$ tbsp.	as preferred

Use scalded milk, except in (4), otherwise mix as in *A*. Wet an earthen or china mold and pour in the mixture. Set in a dish of water and bake, until when tested with a knife, the blade comes out clean. What effect has the large amount of sugar on the consistency? What effect has scalding the milk?

C. Prepare Frozen Custard or French Ice Cream.[1]

I	II
1 c. milk	1 c. thin cream
6 tbsp. sugar	$\frac{1}{2}$ tbsp. vanilla
1 egg	
A pinch of salt	

Make a boiled custard from I; cool, combine with II, and freeze. For proportion of ice and salt to use to obtain a good texture, see earlier lesson.

Milk

Milk is of great importance as a food, and it is estimated that in the United States the per capita consumption is about a pint a day. This is, however, as we shall see, less than is desirable.

Chemical Standards

Because milk is so universally used and forms so large a part of the diet of children and invalids, most States

[1] In French ice cream only the yolks of eggs are used. Some flour may be substituted for egg, if preferred.

have set standards to which the milk sold must conform. These standards are not identical in every State, but are more or less similar. The standards often regulate the minimum amount of fat and of total solids (or of total solids, not fat) which the milk must furnish. They are intended to prevent skimming and watering. The average composition of milk is estimated to be:

COMPOSITION OF MILK

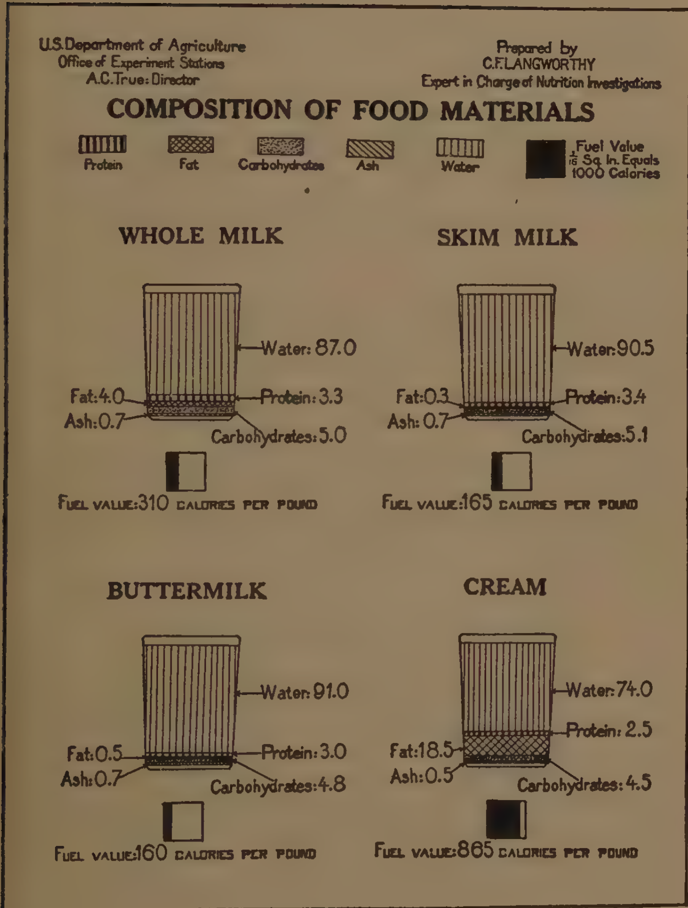
Fat	4.0 per cent
Protein	3.3 per cent
Water	87.0 per cent
Carbohydrate	5.0 per cent
Ash	0.7 per cent
Total solids not fat	9.0 per cent

The fat and protein content of different milks vary much more than do the other constituents. The fat is sometimes as low as three per cent, but may even be six per cent. The protein varies less, from about three per cent to four per cent. Many large cities as well as most of the States have laws in regard to the composition of the milk which may be legally sold. The Commission on Milk Standards, appointed to try and secure uniform requirements, has recommended a standard of at least three and a quarter per cent of fat, with eight and a half of solids, not fat.

The Commission also recommends that milk be sold on the basis of guaranteed composition. Rich milk could then command, as it should, a higher price than milk which is less rich in fat.

Sanitary Standards

In some communities we find sanitary standards also, since great danger lies in the fact that milk is such an



COMPOSITION OF MILK

excellent medium for the growth of bacteria. In many cases these standards divide milk into three grades. Milk of the highest grade can be sold raw only if it comes from cows which have been properly inspected by veterinarians and tested for tuberculosis, and if the milk is so carefully guarded that it never has a bacterial content of beyond 100,000 per cubic centimeter when it reaches the customer. If the milk is pasteurized, it may be sold in this grade if it never has more than 200,000 bacteria per cubic centimeter, and not more than 10,000 per cubic centimeter when delivered.

Milk of the second grade must come from cows that have been examined physically, is pasteurized, and must never have had more than 1,000,000 bacteria per centimeter, and at the time of delivery not more than 50,000.

The third grade must come from cows that have been examined physically, is pasteurized or sterilized, and shall contain less than 50,000 bacteria per cubic centimeter when delivered.

Pasteurization and Sterilization of Milk

To pasteurize milk, it is usually heated to a temperature of 140° to 145° F. and kept so for twenty to thirty minutes, after which it is cooled as rapidly as possible. A higher temperature for a shorter time is sometimes used, but is considered undesirable. The object of pasteurization is to kill any disease-producing germs, but not the germs which eventually cause it to sour. Sterilization, which involves boiling the milk, attempts to kill all the germs present. The process of pasteurization changes the taste less and brings about fewer changes in the substances present than does sterilization.

Sanitary Care in Milk-production

If you have read carefully the sanitary standards suggested for the three grades of milk, you will notice that the lower grades of milk must have fewer bacteria at the time they are delivered than the upper grades. They are placed in the lower grades partly because they are not from tuberculin-tested cows, but also because they at some time contained a great number of bacteria. How can these be avoided? Only by very great care in all the stages of milk-production.

First, since the milk must be protected from dust and dirt, the adjacent parts of the cow, as well as the udder, should be cleaned before milking. The barn must be clean, well-drained, light, and airy. A special washable over-garment, worn only at the time of milking, should be used by the milker, and his hands should be freshly washed. Machines for milking which give good service are now obtainable. It is of importance that the pails be sterilized and covered or "hooded."

As soon as the milk is drawn, it should be removed from the stable to a separate milk-room used only for this purpose. Not only must this room be light and clean, but it should be screened against flies. It should be unnecessary to strain the milk. If this is done, it should be poured through sterilized cloth or cotton. It is important that the milk be cooled as rapidly as possible and kept at a low temperature, since warmth so greatly stimulates the increase of bacteria.

Objection to Use of Preservatives

Because milk sours readily, there is a strong temptation to add preservatives. This practice is forbidden by Federal law for milk shipped from State to State, and is usually

also forbidden by each State for milk sold locally. Such use of preservatives is less common now than formerly, as a result of these laws, and is more likely to occur in small towns without milk inspectors than in large cities. Formaldehyde and borax or boric acid are the more common preservatives used, and they are not at all difficult of detection by chemical analysis.

Most State food laboratories will analyze, free of charge, milk sent in by the consumer. If the milk being used does not sour so rapidly as would seem natural, it is wise to send it for analysis. The danger from preservatives is not great, but they are likely to interfere with digestion.

Care of Milk in the Home

Milk must be carefully cared for after it is delivered as well as earlier, if it is to keep well. It should be kept clean, covered, and cool. These are the three "C's" that the housekeeper should never forget.

How to Keep Milk Clean

Milk bought bottled is likely to be cleaner than other milk. Pouring or dipping milk from large cans and pouring it into a bottle or pail in the street exposes the milk to dust and so is bad. Drawing milk from a faucet of a can does not expose the milk in the can and is a somewhat better practice. Of course, any receptacle to be used for milk should be kept carefully covered both before and after it is filled. A glass preserve jar with a glass top (and no rubber ring) is the best thing to use for this purpose. Of course, neither money nor paper tickets should ever be put in the jar or it will be too dirty to have the milk poured into it afterwards.

Milk should be kept covered even in an ice-box, for otherwise it is likely to absorb undesirable odors and flavors. Bottled milk should be kept in the bottle until it is used. The mouth of the bottle should be carefully cleaned before the milk is poured out unless the cap covers the whole rim of the bottle. If the cap is lost, an inverted tumbler makes a good cover for the bottle.

Old milk should never be mixed with newer milk unless it is to be used at once. In fact, it is better not to pour into the milk again the milk or cream that has stood on the table during a meal.

How to Keep Milk Cool

Milk should be kept at a temperature of 50° F. or below. In ordinary refrigerators the coolest place is just below the ice. This is the best place to keep the milk unless it is in actual contact with the ice. Poor refrigerators do not always have a temperature as low as this. It is easy to test your refrigerator by putting a thermometer in it and letting it stand awhile.

Of course, if milk is to be kept it must not be allowed to stand around for any length of time before it is put into a cool place. Nor should we leave a bottle of milk around in a hot kitchen while we are cooking and then expect it to keep sweet as long as it otherwise would, just because we later put it back into the refrigerator.

Sour Milk

If we want milk to sour for use in cooking, and so forth, it should be poured into an open pan, covered lightly, and set in a warm place. Milk that sours slowly or out of contact with the air is likely to develop the growth of objectionable bacteria and have an undesirable flavor.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 1359. "Milk and Its Uses in the Home."

Questions

1. What precaution will you take in caring for milk in the home?
2. Why will scalding postpone the souring of milk?
3. Describe a process for pasteurization of milk at home.
4. If you are not sure of the sanitary quality of your milk, why will you recommend pasteurization? Why is this especially necessary in milk for babies and little children?
5. For what purpose are eggs used in custards?
6. Why are the eggs beaten only slightly for custards? Why beaten at all?
7. How would the use of flour or cornstarch instead of some of the eggs in custard affect the price? Which of the two would you prefer to substitute and why? How would you get around the necessity for boiling the flour or cornstarch and for not overcooking the egg?

Home Work

1. Can milk be bought in your stores, in "bulk" as well as in bottles? Which will you prefer? Why? What do you have to pay for milk? Does this vary with the season? Is more than one grade of milk sold? What is the standard for milk in your State? in your city? Will your laws allow the sale of skimmed milk? If so, what does it cost? Does its food value justify this price?
2. Make either a soft Chocolate Custard or Floating Island.

Chocolate Custard.

Melt three-fourths of a square of chocolate for each pint of milk used in the custard and stir it smooth with a little of the milk heated. Add the mixture to the rest of the milk and proceed as in making any soft custard. Add two extra tablespoons of sugar.

Floating Island.

Soft Custard

2 c. milk	$\frac{1}{4}$ c. sugar
3 egg yolks	Few grains salt
$\frac{1}{2}$ tsp. vanilla	

Meringue

3 egg whites	3 tbsp. powdered sugar

Make a soft custard, using only the yolks of the eggs. Beat the whites stiff, mix with the sugar, and drop in spoonfuls on top of the hot custard. If desired, the meringue may be browned by being put under a gas broiler or at the top of a hot oven. Also, if desired, chocolate and more sugar may be added in making the custard.

LXII

ACIDS AND MILK

Cream of Tomato Soup

A. **Class Experiments.** Acids and Milk.

The possible effect of heat and acids on sweet milk in making cream of tomato soup.

1. Heat a little milk which is sour, but not separated. Note the result.
2. Mix a tablespoon of tomato juice with one of milk, and heat. Note the result.
3. Add tomato juice, drop by drop, to a little milk, stirring, and see how much juice can be added before the milk separates. Then reverse the experiment, adding the milk to the tomato juice.
4. Make a quarter of a cup of medium white sauce, omitting the salt, and add, stirring slowly, a quarter of a cup of hot tomato juice. Season.
5. Compare the flavor of (4) with soups made by adding a saltspoon of soda to the tomato.

Give the reasons for each of the following precautions in the making of cream of tomato soup:

1. Be sure that the milk is perfectly sweet.
2. Thicken either the tomato juice or the milk. Have each hot, and do not heat further after combining; or combine cold, and heat only to the serving point.

3. Omit salt until ready to serve.
4. Pour the tomato into the milk.
5. Avoid letting the soup stand after it is made.
6. If the milk is old, or the tomato juice very acid, or the soup must stand (as in serving a large number of people), use soda.

B. Cream of Tomato Soup.

Write a recipe for making enough cream of tomato soup to serve four people; then prepare it. For seasoning, heat a few slices of onion, two or three cloves or a bay leaf, in the milk, removing them before serving the soup.

Milk (*continued*)

Fat and Milk

The amount of fat in milk varies with the breed of cow as well as with the feed given. Milk from Jersey cows is high in fat; from Holstein cows, low. Milk from the latter breed is considered better for babies. While the amount of fat in milk averages four per cent by weight, in the cream it usually varies from eighteen to thirty per cent. The fat of milk is in an emulsified form. While the globules of fat vary in size, they are so small that a drop of milk contains many millions of them. This emulsified condition, and the fact that all the fats present have low melting points, make it, like the fat of egg yolk, especially digestible. Babies, however, often have difficulty in digesting much of it.

These fat globules tend to rise to the surface of the milk when it is allowed to stand. Cream rises less readily in pasteurized milk than it does in raw milk, and if the fat globules are broken up still finer by a so-called "homogenizing machine", the fat tends to remain distributed through the milk even on long standing.

Protein in Milk

At least three-fourths of the protein in milk is casein. Some albumin is also present, as well as other proteins in much smaller amounts. These proteins are complete and of high nutritive value. An unusually high percentage of them is digested and absorbed, and they do not readily undergo intestinal putrefaction. The percentage of protein in cow's milk is much greater than in mother's milk. To remedy this, cow's milk for feeding babies is diluted with water, after which more sugar is added.

Sugar in Milk

Sugar of milk is the carbohydrate present in milk. This sugar is less sweet than cane and is supposed to be much better for babies, because it is less liable to irritate the stomach. As, however, cheap grades of milk sugar are impure, and the pure sugar is exceedingly expensive, many doctors recommend the addition of cane sugar or glucose to the diluted milk in baby-feeding.

Mineral Elements

The mineral elements in milk need special mention. Calcium and phosphorus are present in unusual amounts. The iron present seems to be in a form which is most readily assimilated, thus making up somewhat for the small quantity present. Babies are born with relatively more iron in their bodies than adults have. This seems to be nature's way of assuring them a plentiful supply. Diluted cow's milk furnishes less iron than mother's milk, and so babies which are fed artificially have other food added to their diet earlier than those which are nursed.

Souring of Milk

When milk sours, the lactic acid bacteria present change the milk sugar to acid. The acid finally precipitates the protein and the milk "clabbers." Milk containing too little acid to bring about this, may separate when heated. If salt is present, this is even more likely to happen. Herein lies the difficulty of making cream of tomato soup without neutralizing the acid with soda, but the flavor is superior if soda is not used.

Effect of Heating Milk

Boiling milk seems to bring about certain changes in the substances present. The protein is undoubtedly changed, for such milk fails to clot with rennin, while raw milk clots readily. However, the curd from boiled milk is finer and more easily acted upon by the digestive juices. It is possible that the fat is less easily emulsified after the milk is boiled. Such milk is commonly considered more constipating. But the changes of this kind are not great. However, heating even to the pasteurizing temperature probably does lessen the Vitamin C content. This is the vitamin that protects against scurvy. As it is a somewhat variable factor in milk under ordinary circumstances, this result of heating is probably of no consequence in an ordinary diet containing the proper amount of fresh fruit and vegetables. It would, however, be of great importance if it were the only food taken. For that reason it is recommended that all babies fed any other than fresh, raw milk should be given orange juice, tomato juice, or some other suitable food rich in Vitamin C.

Condensed, Evaporated, and Dried Milk

Condensed and evaporated milk are both heated to remove part of the water in the milk, but since the sugar

that is added to the former helps to preserve it, it is heated much less than is evaporated milk. Occasionally such milk is intended for rather immediate use and is sold in bottles, but more commonly it is sold in tin cans. Dried milk, or powdered milk, as it is sometimes called, is milk from which the water is entirely evaporated. While there is still some difference of opinion in regard to the effect of these processes upon the vitamins in milk, it is probable that there is little if any change due to the heating except in the case of Vitamin C, and there is some evidence that Vitamin C, or at least all of it, is not destroyed in the manufacture of condensed milk. However, with our present knowledge it would seem safer, if these are used in feeding babies, to add some such material as orange juice to the diet as we would if the baby were taking pasteurized milk. With this exception, the advantage of using these milks will probably differ with local conditions in regard to the fresh milk supply.

Value of Milk in the Diet

The important thing to remember in connection with milk is its value in the diet. A reasonable amount should be included even by those living at low cost, for milk is undoubtedly the best of all foods to supply the deficiencies of cereals and cereal products, of which the more inexpensive diets necessarily include generous amounts. A quart of milk a day for children up to the age of twelve, and at least a pint a day for older children and adults, are considered the necessary amounts for us to take daily for the best results. These amounts, of course, include any milk that is used in the preparation of our food, as well as what we actually drink or eat on cereals or puddings. A pint and a half of milk a day for children from one to two years old, and a pint a day afterwards, are considered a

minimum standard, but too low to be desirable. Adults can live without milk, but both health and strength are improved by using it.

Many people do not recognize cases of poor nutrition. With children the results are sometimes more evident in after life than they are immediately. Sherman tells us that "in no other way can the food habits now prevailing, especially in the cities, be so certainly and economically improved as by a more liberal use of milk." This is because "American dietaries are probably more often deficient in calcium than in any other element." He says that it is desirable from the economic standpoint to use a quart a day per person when "the milk does not cost more than twice as much per 100 calories as the average of the food eaten." That is because the other foods necessary to supply some of the elements we obtain in milk would probably be still more expensive.

References

As in the previous section.
"Food Products", by H. C. Sherman. Chap. III, "Milk." Chap. IV, "Milk Products."

Questions

1. What is meant by scalding milk? How can you easily tell when it is scalded?
2. Why is milk usually heated in a double boiler? When may this be done over a direct flame?
3. Since chocolate fudge is so likely to separate in cooking would you infer that acid is present in chocolate? Does the separation affect the final product?
4. Why is milk so necessary for growing children?
5. How much milk should we drink?

Home Work

1. Find out the cost of condensed, evaporated, and dried milk if they are sold in your community. Compare

the cost of a quart of milk made from each of them with the cost of a quart of fresh milk. Is it any economic advantage for you to use them? If so, which is cheapest?

2. Try using the one you find least expensive in making some milk dish — as blanc mange, or custard, and see if you can detect any difference in flavor due to the milk used.

LXIII

CURD OF MILK

COTTAGE CHEESE
JUNKET CUSTARD

A. **Class Experiments.** THE EFFECT OF HEAT ON SOUR MILK.

1. Test milk, sour enough to have clabbered, with blue litmus paper. Cut a little of the milk with a knife and strain some of the whey through cheesecloth. Save both curd and whey for comparison.
2. Boil half a cup of the milk for three minutes. Strain through a cheesecloth and compare with the curd obtained in (1), (3), and (4). Reserve the whey.
3. Heat half a cup of the milk in a double boiler until it separates. Strain through cheesecloth.
4. Pour half a cup of boiling water into half a cup of the sour milk. Take the temperature of the mixture. Strain the curd as before.
5. Compare the whey of unheated milk with the whey obtained by heating, and decide why heat is used in separating. Examine the texture of the curds and determine the effect of great heat. Which methods of separation should be used in making cottage cheese?

B. Prepare Cottage Cheese.

Season and serve as a salad.

C. **Class Experiments.**

1. To one-fourth of a cup of milk, add half a teaspoon of rennin[1] solution. Boil, and set aside in a mold, until cool.
2. To one-fourth of a cup of lukewarm milk, add half a teaspoon of rennin solution. When cool, compare with (1).

D. Junket Custard.

Make a recipe for a "Junket Custard", using chocolate, caramel, or vanilla, as flavoring, and prepare the custard.

Food for Children

The subject of food for children is an important one, for the digestions of little children are easily upset. Moreover, failure in obtaining a properly balanced diet means failure in proper development and growth.

Some Foods to Avoid

Certain dishes are excluded from the children's bill-of-fare for various reasons. Coffee and tea should not be allowed, because they are nerve stimulants. Even cocoa as a regular drink is objectionable, for it, too, contains a stimulating principle. If given on special occasions it should be made with very little cocoa. Hot water with milk, or cereal coffee, will furnish hot drinks when called for, but all children should be encouraged to drink plenty

[1] Rennin solution is made by dissolving a junket tablet in two tablespoons of water.

of milk. A quart of milk a day for each child should be provided. This does not mean that such an amount must necessarily be drunk, because, when preferred, some of it may be served in soup, in white sauce, or in simple puddings. Secondly, foods containing much fat are excluded, because they are difficult of digestion. This means pastry, fried foods, rich cake, and rich sauces. For the same reason, pork, the fat of meat, and rich fish like salmon and mackerel are forbidden. Spices, condiments, and strong acids such as vinegar, are also better omitted, as are raw foods containing much cellulose, as celery, cabbage, and radishes.

Vegetables, Fruits, and Milk

Because children are growing, it is especially necessary that they have plenty of mineral salts and vitamins, and this, of course, means plenty of vegetables, some fruit, and milk. Dietary authorities tell us that the amount of calcium in the diet is usually dependent upon the amount of milk used, and as children need calcium for their bone formation, the use of a quart a day, at least until the individual attains full growth, will supply this element. More than a quart a day, at least for little children, is objectionable because it excludes the eating of enough other food, and milk does not contain enough iron for more than the first months of a child's life.

Almost any vegetable can be given if it is prepared properly for the child. All very young children are likely to swallow with insufficient chewing. Carrots, spinach, string beans, and green peas are excellent, but for children of a year and a half or two years old such foods should be mashed through a strainer and then served plain or in soup. At first, baked and freshly boiled potatoes mashed with only a little butter, later potatoes in

any form, are valuable for daily use, as they are fairly high in iron, calcium, and phosphorus as well as vitamins.

Bananas and cheese are so readily swallowed in lumps that the form in which these are served must be considered. But bananas as well as apples can be given, even to very little children, if they are scraped or baked. Children are especially susceptible to infection, so raw fruits must be clean. Berries bought in market are almost impossible to clean properly, and so are safer cooked. Figs and dates can be washed in hot water and sterilized in the oven.

Sugar and Candy

Sugar may be given in moderate amounts, but it is much better not to stimulate the child's taste for it. Don't teach the baby to eat sugar. When given at all, as candy or otherwise, it should be at the end of a meal. The objections to its use on cereals is that the child should be led to eat only because he is hungry, and not because he likes the taste of a special dish. Sugar is much more likely to be irritating when taken on an empty stomach. Moreover, when eaten last, it is less likely to interfere with the appetite for other foods.

Many authorities say that children are better off without meat until they are eight or nine years old. There is no question that many children are given meat in too large amounts, but on the other hand it is possible to give too little protein, since it is an indispensable building material, and some children respond well to variety in their food. It should not be omitted unless eggs and milk are used freely; but, as Miss Hunt points out, a child of even six to nine years of age would have sufficient protein in his daily diet from one egg, three glasses of milk, and what he will secure from the bread, cereals, and vegetables which the normal child can be depended upon to eat.

Training in Eating-habits

Children should be trained in eating-habits just as much as in others. Many make the mistake of giving the little child only soft, mushy foods, and then wonder that he does not learn to chew. Crusts of bread and hard crackers are excellent educators for children beginning to eat. Moreover, both the teeth and the jaws need exercise for their proper development.

Most mothers are in a hurry and feed the child too rapidly. The next spoonful is waiting at his lips before he has swallowed the first. So the children learn to eat too rapidly. The older child is too often forbidden to talk at the table, so even that interference with rapid eating is done away with. It is wise not to excuse children from the table when they have finished, but to require them to stay until the end of the meal. The child in a hurry to return to play will eat much more rapidly if he knows he can go when he has finished eating.

Children should be trained to like all kinds of food that are not unsuitable because indigestible or too stimulating. If, as little children, they are fed vegetables in purées and soups, the difficulty which often occurs in teaching an older child to like them will be avoided. Much can be accomplished by suggestion. If the older people do not eat a variety of food, or if a child's dislikes are dwelt upon, difficulties will arise. The assumption that the flavor of a food is delicious and that the child will like it, will go far.

Water-drinking is another habit which may need attention. Food should not be washed down, nor should the water be iced; otherwise, water at meals is desirable. Remember that children, as well as older people, need plenty of water. Most adults drink too little water.

Regularity in Time of Eating

Children should not eat whenever they are hungry, but at regular times. Lunches between meals should be provided regularly for little children. Care should be taken that the food be of such a nature as to be digested quickly, so as not to interfere with the following meal. It should be of such a character as to tempt only the hungry child to eat.

LUNCH KIT FOR SCHOOL CHILDREN

Amount of Food Needed

The amount of food required by children at various stages of their growth is shown in a table in the Appendix. The total amount is considered a minimum rather than an outside limit. A child with a natural, unspoiled appetite, fed simple, nourishing food, can safely be trusted not to over-eat.

REFERENCES

U. S. Dept. of Agriculture. Farmers' Bulletin No. 717. "Food for Young Children (3–10 years old)."

U. S. Dept. of Interior, Bureau of Education, Health Educ. No. 2. "Diet for the School Child." "Feeding the Family", by M. S. Rose.

QUESTIONS

1. Plan a series of meals for three days for a child of three, of six, and of ten.
2. Plan five school lunches for a child of ten.
3. Sum up the principal points concerned in the feeding of children.
4. Name as many ways as you can for disguising the taste of milk for use with children who do not like to drink it.

Home Work

Watch your younger brothers and sisters and see if you can help them to eat the right food. Don't just "tell them to", but plan races, offer simple rewards, and so forth. Talk the matter over with your parents and teacher first to be sure your plans are right, then report at school any attempts which are successful. Older children can be a great help to the younger ones by setting a good example, as well as by suggesting good looks and athletic possibilities as results of properly balanced food.

LXIV

CHEESE

Cheese Pudding
Welsh Rabbit
Mock Welsh Rabbit
Cheese Sandwiches

A. **Class Experiments.** Effect of Extreme Heat on Cheese.

1. Heat a small piece of cheese for some time in a hot frying pan. Allow it to cool, and examine. What two constituents do you find present? What is the effect of extreme heat on protein? on fat?
2. Heat another small piece of cheese in a double boiler (or over water). After the cheese is melted, cool it, and compare with (1).
   What precautions must be taken in cooking cheese?

B. Prepare Cheese Pudding — a luncheon dish.

1 c. milk	$\frac{3}{4}$ c. cheese, grated or cut into small pieces
1 egg, beaten slightly	
1 c. bread crumbs	$\frac{1}{2}$ tsp. salt

Paprika

Bake in a buttered dish, placed in hot water, in a moderate oven, until firm.

C. Prepare Welsh Rabbit.

$\frac{1}{4}$ lb. cheese	Cayenne or paprika
2 tsp. butter	1 egg, beaten slightly
$\frac{1}{2}$ tsp. mustard	1 c. milk
$\frac{1}{2}$ tsp. salt	4 slices toast

Melt the cheese and butter in a double boiler, mixed with the dry ingredients, and add the egg in the milk as soon as the cheese is melted. Stir, until it thickens, and pour over toast.

Cheese

Cheese first was probably only a means of preserving milk; now there are several hundred varieties. Like butter, cheese was a home-made product until about 1850, while now, except for cottage cheese, almost no family makes its own supply.

How Cheese Is Made

In making cheese, the milk is first allowed to "ripen" until it is at the right stage of sourness. Sometimes lactic-acid-forming bacteria are added to the milk in order to hasten the souring. If the cheese is to be colored, the coloring material is mixed with milk. Rennet is then stirred into the milk. This is a ferment capable of clotting milk, obtained from the lining of calves' stomachs. When the curd has formed, it is cut into small pieces; these are stirred and heated somewhat and piled up to drain off as much whey as possible, and so improve the texture of the cheese. The curd is again cut into small pieces and salted and pressed. The salt helps to check any further souring. The product at this stage is called green cheese, and is lacking in flavor until it undergoes a ripening process. For this purpose the cheese is stored

at the desired temperature for weeks and even months until various ferments or micro-organisms, mainly bacteria, produce the desired flavor and texture. Finally, the rind is treated with disinfectants and painted or varnished to protect the cheese from further action.

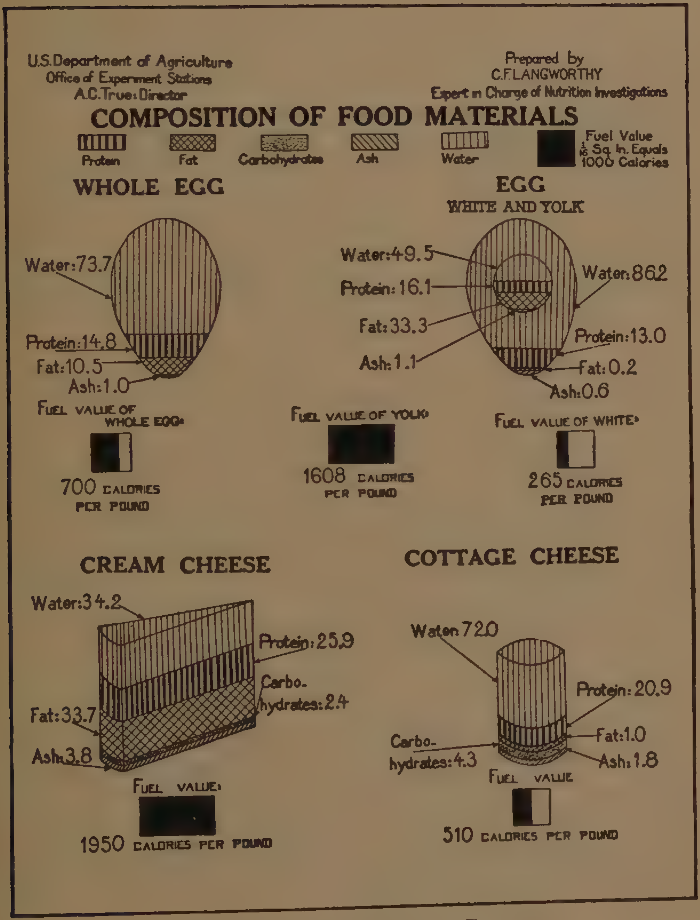
Two Types of Cheese

Cheese is of two main types — hard and soft. Almost three-fourths of the cheese used in this country is hard cheese, of which "American Cheese" is an example. A more accurate name for this cheese is "American Cheddar Cheese." It is often called "New York Cream Cheese."

Milk from goats may be used in making cheese. Some cheese is made from skimmed milk; some from whole milk; some even from whole milk to which cream has been added. In "filled cheese", the cream is removed and lard or some other fat is substituted. The sale of skimmed-milk cheese and of filled cheese is often regulated by State laws. Federal laws require the sale of filled cheese in labeled packages.

Value in the Diet

Cheese is often considered difficult of digestion, but undoubtedly part of this trouble is due to the failure to chew it sufficiently. Moreover, cheese, which is highly nutritious, is commonly eaten at the end of a meal and the consequences of over-eating are laid to the indigestibility of the cheese. As a pound of cheese usually represents the casein and fat from about a gallon of milk, it is obviously a very concentrated food. Experiments conducted by Langworthy show that cheese is digestible both as to ease and completeness of digestion, there being "practically no difference between the cheese and the



Composition of Eggs and Cheese

meat with respect to ease of digestion, at least in such quantities as are commonly eaten."

Practically all of the iron, calcium, and phosphorus of the milk from which it is made are found in ordinary cheese, so that it is very high in these elements, as it is also in fat-soluble vitamin.

American cheese is, then, a good substitute for meat, and, at ordinary prices, a cheap source of protein.

References

U. S. Dept. of Agriculture. Farmers' Bulletin No. 487. "Cheese and Its Economic Use in the Diet."

Questions

1. Look up the average composition of cheese.
2. How does it compare with meat as a source of protein? In true nourishment?
3. Give examples of hard and soft cheeses.
4. Discuss the digestibility of cheese. Give as many reasons as possible why it is ordinarily considered somewhat indigestible.
5. In making macaroni and cheese, would it be better to sprinkle the cheese on top, or mix it with the white sauce? Give the reason.
6. Suggest different cheese dishes.
7. Give the essential steps in the making of cheese.

Home Work

1. What does ordinary cheese cost a pound? How does it compare in expense with meat as a source of protein? of calories? What other kinds of cheese are for sale in your markets, and what do they cost?

2. Prepare Mock Welsh Rabbit, or Cheese Sandwiches.

Mock Welsh Rabbit.

1 pt. medium white sauce
½ c. grated cheese
6 slices toast

Make a pint of white sauce and just before taking it from the fire, stir in the cheese, and as soon as it is blended pour at once over the toast.

Cheese Sandwiches.

Butter thick slices of bread. Cover one side of a slice with grated cheese, sprinkle with salt and pepper, and cover with a second slice. Place the sandwiches in a pan in a hot oven and leave until they are golden brown. Serve at once. If the oven is too cool, the heat will penetrate the bread and overheat the cheese.

LXV

BALANCED DIETS AND THE COST OF FOOD

Each student should bring to class a menu for a day's meals for four people, with a list of the amount and cost of each food used, and the order in which one person should go to work to prepare each meal. In presenting them to the class, the student should explain her reasons for the choice of a food or food combination. The class should then criticize, and select the plans that seem best, taking into consideration the cost in labor involved as well as the money. Some good ways should be devised to utilize this food after it is prepared, and some of the meal plans should then be carried out in the way which best fits into the plan adopted for using the food.

Balanced Diets and the Cost of Food

Many people seem to think it must be a very difficult task to plan a balanced diet, especially if the expense is kept down. But this is not true. One can easily select one's own food or plan for others if one knows for what to aim.

Dividing the Food Budget

During the war the Food Administration issued a leaflet with this general advice:

Divide your money into five parts. Spend
- One-fifth, more or less, for vegetables and fruits;
- One-fifth, or more, for milk and cheese;
- One-fifth, or less, for meat, fish, eggs, and so forth;
- One-fifth, or more, for bread and cereals;
- One-fifth, or less, for sugar, fat, tea, coffee, flavoring, and so forth.

This division of foods is almost that of our Five Food Groups, except that milk and cheese are made a separate group instead of being included in the "meat, fish, egg" group, and sugars and fats are classed together. This change was made to emphasize the value of milk.

Two Important Rules

Dr. Sherman in his "Food Products" gives two good rules for buying food.

One is that "at least as much should be spent for fruits and vegetables as for meat, poultry, and fish." Here is, then, an easy way of checking up on the relative amounts of these in a family diet. If one must economize, buy the less expensive fruit and vegetables, but have plenty of them, for they are invaluable sources of vitamins and mineral matter. Then let us remember not to lose the mineral matter in preparing the food, or we defeat our own ends.

Sherman's second rule, that "at least as much should be spent for milk (including cream and cheese, if used) as for meat, poultry, and fish", will not surprise us after what we have learned in regard to the value of milk, especially as a source of calcium.

A Study of Food Expenditures

In a recent study of 224 representative American families, the following facts [1] were discovered.

[1] From "Food Products", by H. C. Sherman, pp. 553–572.

1. Those diets that contained most meat were poorest in vitamins A and C, and probably also in B. They furnished fewer calories, less calcium and phosphorus, and no significantly greater amounts of either protein or iron.

This is not an argument for eating no meat. It is true because Americans as a whole use much more meat than people in other countries. In the high meat diets of the country the amount spent for meat (including poultry, fish, and so forth) is almost half of the total amount spent for food.

2. Those diets that provided greater amounts of milk, vegetables, and fruit showed the use of less meat and grain products, but practically the same amounts spent for eggs, fats, and sugar.

They were lower in cost, higher in calories, and provided more protein, calcium, phosphorus, and iron, as well as vitamins, than did the diets furnishing only medium amounts of milk, vegetables, and fruits.

Benefits of Using Milk, Vegetables, and Fruits Freely

Sherman points out that the increased use of these three kinds of food "had the effect of improving the diet materially in every known factor of food value without increasing the cost" when compared with what was spent for food in families that used only average or medium amounts of such foods.

A New Division of the Food Budget

With these facts in mind, we can appreciate the value of the following division of our food money, which is being recommended at the present time.

First, buy enough milk to provide a quart a day for each child and at least a pint a day for each adult.

Second, divide the rest of the money to be spent into three approximately equal parts:

One for fruit and vegetables;
One for bread, cereals, butter, and other fats;
One for meat, eggs, sweets, and miscellaneous foods.

Cost and Waste

There is one factor in the cost of food that, they tell us, Americans are likely to forget. If we waste food, we pay for something from which we get no benefit. We pride ourselves on being a shrewd people, so if we really waste food, we ought to realize how foolish we are.

Here are some ways in which we can save food:

1. Buy the right amounts — so that all will be used before it spoils.
2. Eat all there is on our plates. Serve only amounts that we know will be eaten.
3. Take care to prepare food so that it is appetizing, not scorched or over-seasoned.
4. Find ways to use up *all* left-overs. With care these can be made as attractive as when originally served.

Reference

Sherman. "Food Products." Chap. XIII.

Questions

1. What practical differences would result from spending your food money on the basis of a fifth for each class of foods, and on the basis of the final recommendation given on this page?
2. How can we justify these differences?
3. Make a list of fruits and vegetables that are likely to be cheap when they are in season. Write after each any vitamin or mineral substance in which it is notably high.

Home Work

1. Make a list of the principal meats which are in your market, giving typical cuts and their round prices per pound at the present time. Make a cross against those which you consider the cheaper meats, taking waste from bone, gristle, and so forth, into consideration.

2. Watch for instances where one is tempted to throw away food. Plan how this waste could have been or can still be avoided.

3. Working from the food bills for a month (keep a food account for that length of time, if necessary), check up and see how your home expenditures agree with the suggestions made in this lesson. If you have a school lunch-room, see how these expenditures come out.

APPENDIX

I. Standards for Food Requirements

A. Calories Needed.

For Adults

1. Atwater's and Benedict's Standard for Total Calories for average man weighing 154 pounds.

Man sleeping requires	65 calories per hour
Man sitting at rest	100 calories per hour
Man at light muscular exercise	170 calories per hour
Man at active muscular exercise	290 calories per hour
Man at severe muscular exercise	450 calories per hour
Man at very severe muscular exercise . . .	600 calories per hour

The average woman is supposed to require eight-tenths of the amount needed by the man. This is based on the fact that the average woman weighs eight-tenths of the weight of the average man.

Using the figures given above, the daily requirement for a *man* of average weight with the given activity would be as follows:

8 hours of sleep [65 cal. needed each hour]	520 calories
6 hours of sitting[1] [100 cal. needed each hour] . . .	600 calories
5 hours of light exercise[2] [170 cal. needed each hour] .	850 calories
4 hours of active exercise [290 cal. needed each hour] .	1160 calories
1 hour of severe muscular exercise[3] [450 cal. each] .	450 calories
24 Total Calories needed per day	3580

[1] Eating, reading, writing, etc.
[2] Moderate walking, dressing, etc.
[3] Chopping wood, digging ditches, etc.

Of course, to be absolutely accurate, each kind of exercise would need to be calculated separately. It has been determined, for instance, that hand-sewing requires about 111 calories per hour for a man of average size; dressing and undressing, 118 calories; dishwashing, 144 calories; sweeping a bare floor, 169 calories; walking slowly, 200 calories; walking moderately, 300 calories. But even these amounts all vary with conditions: how much we do in an hour, whether we work quickly or slowly, and how continuously we work. But on the whole, these approximations are probably as accurate for general use as we can have them.

2. Atwater's Standard for Total Calories for adults under different conditions of activity.

Man with hard muscular work	4150
Man with moderately active work	3400
Man at sedentary or woman with moderately active work	2700
Man without exercise or woman at light to moderate work	2450

This standard is still more general than the one just discussed. It will serve mainly, perhaps, as a check on the calories calculated by the other standard.

For Young People and Children

The calories required during growth are high in proportion to those needed by adults. This is a period of great activity (except possibly for the city child), for which provision must be made. During this period it is considered advantageous if the weight is somewhat above rather than below average.

How to Use This Table

To find how many calories any grown individual should eat, look in the table to see how many calories he should

have per pound at that age. Then multiply his actual weight by this figure.

For example: —

Calories per pound for girl of three years	40
Actual weight of girl	32
Product of multiplication	1280

The average amounts are stated to serve as a check, but the product of the calories per pound and the actual weight is the more accurate figure. Many well-nourished children weigh and measure above average, and eat (and need) many more calories than the "average" for their age.

Total Daily Calories[1]

Age, Years	Girls			Boys		
	Average Weight Pounds	Calories Needed per Pound	Average Daily Calories	Average Weight Pounds	Calories Needed per Pound	Average Daily Calories
1	21	45	940	22	45	950
2	26	43	1110	27	42	1135
3	31	40	1230	32	40	1275
4	35	37	1300	36	38	1380
5	40	36	1410	40	37	1490
6	44	34	1520	44	36	1600
7	48	34	1660	48	36	1740
8	53	34	1815	53	36	1920
9	58	34	1990	58	36	2110
10	63	35	2195	64	36	2330
11	69	36	2520	69	36	2510
12	79	36	2864	75	36	2735
13	89	36	3210	84	36	3040
14	99	34	3330	94	36	3400
15	106	30	3235	106	36	3850
16	112	28	3160	120	34	4090
17	116	26	3060	127	31	3945
18	117	25	2950	132	28	3730

[1] From "Food, Health, and Growth", by L. E. Holt.

B. Protein Needed.

How much protein is desirable daily is still unsettled. About fifteen per cent of the total calories should come from protein, according to Atwater; twelve per cent, according to Langworthy; eight and one-half per cent, according to Chittenden.

Mothers' milk furnishes a little less than one-tenth of the total calories from protein. As this is by nature intended for the period of greatest growth, this is probably enough for any age, provided the protein is well adapted for use in body-building.

Since much of the protein we eat is not "complete", it would seem best to say that from ten to fifteen per cent of the total calories required should come from protein.

Mrs. M. S. Rose advises the following amounts of protein for children and young people:

Age	Protein Calories per Pound of Body Weight
12–17	3
3–12	3 to 4
1– 2	4

C. Mineral Elements Needed.

This has not been determined so accurately as has the total calorie requirement. It is probable that there is a larger demand for mineral elements in proportion to the total calorie requirement during growth than in adult life. Calcium, iron, and phosphorus are the mineral elements which are least likely to be present in sufficient amounts.

For Adults

The requirement is usually stated as follows: —

Calcium	0.67 gram
Phosphorus	1.32 gram
Iron	0.015 gram

E. B. Forbes of the Ohio Experiment Station says: "Generally speaking, a high ash content of the food is desirable, since the organism is much better able to handle an excess of ash constituents than to meet a deficiency." As calculating the amount of the various mineral elements present in a dietary is somewhat difficult and likely to be inexact, owing to difference in the preparation of foods, we usually satisfy ourselves by seeing that the diet contains plenty of food supplying mineral elements.

For Young People and Children

The mineral requirement of children and young people is less definitely determined as yet. It is probable[1] that children from four to six years of age need at least half the total amount of phosphorus and iron needed by the adult man, and that children from six to eight years need at least two-thirds of that amount. Older children need the full adult amount or more.

All children, we believe, need a gram of calcium a day. Because the calcium of milk seems to be better utilized than the calcium of vegetables, and because this seems to be the easiest and most practical way to take care of the high calcium requirement, the use of a quart of milk a day for each child up to the age of twelve to fourteen years seems necessary for the best health and development.

The following tables enable one to calculate, with little labor, the mineral elements most likely to be present in insufficient amounts in our diet.

[1] From studies of diets made at the University of Chicago.

Tables Showing the Important Mineral Elements in Servings of Some Common Foods

Part I

In Table A, the figures express the approximate number of servings that would be necessary to provide the amount of iron, calcium, and phosphorus required in a day, if all the mineral element were to come from that food.

How to Read Table A

This table says, for example, that it would take 47 servings of round steak to furnish the calcium necessary for a day's ration, if all of the calcium came from the steak; five servings to furnish the necessary phosphorus, if all the phosphorus came from the steak, and so forth. Or, to put it in another way, it means that if you have eaten a quarter of a pound of round steak, you have $\frac{1}{47}$ part of the calcium you need for the day, $\frac{1}{5}$ of the phosphorus, and $\frac{1}{4}$ of the iron.

How to Use Table A

To show how this table can be used practically, let us suppose we desire to include more iron in our diet. Find in the table those foods requiring the *fewest* number of servings to supply the iron needed for a day. Then, in our actual diet, let us eat servings of those foods in place of others which take a *large* number of servings to supply us with iron.

Table A

The Relative Value of Servings of Some Common Foods for Supplying Calcium, Phosphorus, and Iron

Kind of Foods	Amount of One Serving	Number of Servings Necessary to Furnish Approximately as Much as the Daily Requirement of		
		Calcium (.67 g.)	*Phosphorus* (1.32 g.)	*Iron* (.015 g.)
Protein Foods				
Beef, round steak	$\frac{1}{4}$ lb.	47	5	4
Fish, white . . .	$4\frac{1}{2}$ oz. ($6\frac{1}{4}$ as bought)	$21\frac{1}{2}$	4	$9\frac{1}{2}$
Egg	1 medium-sized ($1\frac{3}{4}$ oz. without shell)	20	$14\frac{1}{2}$	10
Egg yolk . . .	1 yolk ($\frac{3}{4}$ oz.)	29	15	10
Milk	1 cup ($\frac{1}{2}$ pt.)	2	6	25
See also Nuts				
Cheese, American	1 inch cube	$3\frac{1}{2}$	$9\frac{1}{2}$	50
Cereals and Jelly				
Bread, white . .	1 medium slice ($1\frac{1}{2}$ oz.)	62	$35\frac{1}{2}$	$37\frac{1}{2}$
Bread, whole wheat	1 medium slice ($1\frac{1}{2}$ oz.)	$33\frac{1}{2}$	19	25
Bread, graham	1 medium slice ($1\frac{1}{2}$ oz.)	$33\frac{1}{2}$	15	15
Jelly, fruit . . .	1 tbsp.	239	825	150
Rice	2 tbsp. uncooked	268	49	50
Rolled oats . . .	3 tbsp. uncooked	$64\frac{1}{2}$	$22\frac{1}{2}$	25
Shredded wheat .	1 biscuit	$58\frac{1}{2}$	$14\frac{1}{2}$	$11\frac{1}{2}$

Kind of Foods	Amount of One Serving	Number of Servings Necessary to Furnish Approximately as Much as the Daily Requirement of		
		Calcium (.67 g.)	*Phosphorus* (1.32 g.)	*Iron* (.015 g.)
Vegetables				
Asparagus . . .	5 stalks, 8 in. long	22	30	13½
Beans, navy . .	⅕ cup, raw ½ cup, cooked	9½	6	4½
Beans, Lima . .	2 tbsp. dried (1 oz.)	31½	13	7
Beans, string . .	½ cup (2½ oz. cooked)	21	36	18½
Beets, canned . .	4 small beets (3½ oz. cooked)	23	34	25
Cabbage . . .	1 serving (2¾ oz. raw)	18½	57	17
Carrots	1 serving (2½ oz. raw)	17	41	37½
Cauliflower . . .	⅙ medium head (3 oz. raw)	6½	26½	30
Celery	½ cup of ¼ in. pieces (raw)	12½	52½	50
Corn, green . .	½ cup	111½	13	18½
Cucumbers . . .	9 medium slices	96	89	
Lettuce, leaf . .	5 medium-sized leaves	52	105	75
Onions	1 medium-sized (3¼ oz. raw)	22	33	30
Potatoes . . .	1 medium-sized (5 oz. raw)	34	16	8½
Spinach	1 serving (½ cup cooked)	8½	17	3½
Tomatoes . . .	½ cup (cooked)	47	40½	30
	1 medium, raw (4 to pound)	54	45	30
Turnips	¾ cup of ½ in. cubes	11	30	30

Kind of Foods	Amount of One Serving	Number of Servings Necessary to Furnish Approximately as Much as the Daily Requirement of		
		Calcium (.67 g.)	*Phosphorus* (1.32 g.)	*Iron* (.015 g.)
Fruits				
Apples	1 medium-sized (5 oz.)	68½	78½	37½
Bananas	1 small (2¼ oz.)	113½	65½	37½
Dates	6 large (1½ oz.)	23	52½	10½
Figs	3 (1¼ oz. dried)	12	32½	10½
Grapefruit	½ medium (7 oz.)	15	31	25
Oranges	1 medium-sized (4½ oz.)	12	50	50
Prunes	6 medium (1½ oz. dried)	35½	36	13½
Raisins	2 tbsp. (¾ oz.)	52½	50	37½
Rhubarb	1 cup of 1 in. pieces, raw	14	40	8½
Strawberries	1 cup	8½	24½	10
Nuts				
Almonds	10–15 nuts (½ oz. shelled)	18½	19	25
Peanuts	⅛ cup, shelled (1 oz.)	31½	11	25
Walnuts, English	6 nuts (¾ oz.)	37½	18½	37½

PART II

Table B gives the actual weight in grams of the servings suggested in the first part of the table, with the actual weight in grams of the calcium, phosphorus, and iron furnished.

How to Read This Table

This table says, for example, that the quarter-pound serving of steak in Table A actually weighed 115 grams before it was cooked, and furnished 0.0142 gram of calcium, 0.2640 gram of phosphorus, and 0.0037 gram of iron.

How to Use This Table

Suppose you wish to know whether you are getting enough iron in your day's food. Find the actual amount of iron in the number of servings of the different kinds of food you have eaten and add them together to obtain the total. If your serving is different in amount from the one given here, make the necessary changes. If, for example, you have eaten only half as much steak, put down half the amount of iron given in the table, as follows: —

			Iron
1 serving of steak, $\frac{1}{4}$ lb.	=	$\frac{1}{2} \times 0.0037$ =	0.00185
1 pint of milk	=	2×0.0006 =	0.0012
4 servings of white bread	=	4×0.0004 =	0.0016
1 serving of cabbage	=		0.0009
Etc.			
Total			0.00555 gram

Table B

The Actual Weight in Grams of the Servings Suggested in Table A

Kinds of Food	Weight of Serving in Grams	Amount in Grams Found in One Serving		
		Calcium	Phosphorus	Iron
Protein Foods				
Beef, round	115 (raw) E. P.[1]	0.0142	0.2640	0.0037
Cheese	20	0.1862	0.1366	0.0003
Egg	50 (without shell)	0.0335	0.0900	0.0015
Fish, white	125 (raw) E. P.	0.0312	0.3283	0.0016
Milk	244	0.2968	0.2267	0.0006
Yolk [egg]	17	0.0233	0.0890	0.0015
Carbohydrate Foods				
Bread, white	40	0.0108	0.0372	0.0004
Bread, whole wheat	40	0.0200	0.0700	0.0006
Bread, graham	40	0.0200	0.0872	0.0010
Jelly	20	0.0028	0.0016	0.0001
Rice	28 (raw) 120 (cooked)	0.0025	0.0269	0.0003
Rolled Oats	15 (raw)	0.0104	0.0588	0.0006
Shredded wheat	28	0.0115	0.0907	0.0013
Vegetables				
Asparagus	113	0.0305	0.0443	0.0011
Beans, navy	45 (raw)	0.0720	0.2120	0.0032
Beans, Lima	30 (dried)	0.0213	0.1014	0.0021
Beans, string	70 (cooked)	0.0322	0.0364	0.0008
Beets, canned	100 (cooked)	0.0290	0.0390	0.0006
Cabbage	80 (raw)	0.0360	0.0232	0.0009
Carrots	70 (raw)	0.0392	0.0322	0.0004
Cauliflower	82	0.1008	0.0500	0.0005
Celery	68	0.0526	0.0251	0.0003
Corn	99	0.0060	0.1020	0.0008
Cucumbers	45	0.0070	0.0149	0.0001
Lettuce	30	0.0129	0.0126	0.0002

TABLE B (*Continued*)

Kinds of Food	Weight of Serving in Grams	Amount in Grams Found in One Serving		
		Calcium	Phosphorus	Iron
Onions	90	0.0306	0.0405	0.0005
Potatoes	140 (raw)	0.0196	0.0812	0.0018
Spinach	115 (cooked)	0.0771	0.0782	0.0041
Tomatoes	127 (cooked)	0.0143	0.0323	0.0005
	113 (raw)	0.0124	0.0294	0.0005
Turnips	95	0.0604	0.0439	0.0005
Fruits				
Apples	140 E. P.[1]	0.0098	0.0168	0.0004
Bananas	65 E. P.	0.0059	0.0202	0.0004
Dates	45 E. P.	0.0293	0.0252	0.0014
Figs	35 E. P.	0.0567	0.0406	0.0011
Grapefruit	215 grams E. P.	0.0452	0.0430	0.0003
Oranges	125 E. P.	0.0563	0.0263	0.0003
Prunes	35 E. P.	0.0189	0.0368	0.0011
Raisins	20 E. P.	0.0128	0.0264	0.0004
Rhubarb	108 (raw)	0.0473	0.0335	0.0018
Strawberries	192	0.0780	0.0540	0.0015
Nuts				
Almonds	15 (shelled)	0.0359	0.0698	0.0006
Peanuts	40 (unshelled)			
	30 (shelled)	0.0213	0.1197	0.0006
Walnuts, English	50 (in shell)			
	20 (shelled)	0.0178	0.0716	0.0004

[1] E. P. = edible portion.

D. Vitamins Needed.

As has already been said, we cannot yet state definitely just how much of any one of the vitamins is needed for the best health and growth. Nor can we yet state exactly how much of each vitamin is to be found in all of our foods. Quantitative work of this sort has only recently been undertaken. The following table shows the present state of our knowledge.

Vitamin A is necessary for growth and health. It used to be called the "fat-soluble" vitamin, but there are now three such vitamins recognized. Foods which supply us with large amounts of this vitamin are milk, butter, cream, eggs, and leaf vegetables. Since this vitamin seems to be somewhat easily destroyed by heat and oxidation, all vegetables, but especially leaves like cabbage and spinach, should be cooked as short a time as possible. An insufficiency of this vitamin seems to render us susceptible to infectious diseases and to make normal nutrition impossible.

Vitamin B, so-called, may really be two vitamins instead of one. It protects us from nerve disease and, like A, is also necessary for growth. It is more widely distributed in our foods than are the other vitamins, but a diet that contains too much fat, sweets, and white flour may not provide us with enough of it, for these foods contain little if any Vitamin B. An insufficient supply results in loss of appetite and digestive difficulties.

Vitamin C is necessary to prevent scurvy. It is found chiefly in fruits and vegetables, and as a rule is easily destroyed by heat. Therefore oranges, lemons, grapefruit, raw cabbage, lettuce, and tomatoes are all important sources of it in our diet, because we eat these foods uncooked. Tomatoes, however, remain rich in it even after cooking. Potatoes, apples, and bananas are also important sources of

supply, because we use these foods so plentifully. Milk varies in the amount of this vitamin, apparently being influenced by the feed of the cow. An insufficiency of this vitamin results in sallow, muddy complexions, loss of energy, pains often mistaken for rheumatism, and tooth decay. We apparently need generous amounts of Vitamin C.

Vitamin D is another of the fat-soluble vitamins, recently discovered. It prevents such bone-disease as rickets. It is found in egg-yolk, milk, butter, and green vegetables, as well as in cod-liver oil. It can be formed to some extent by the exposure of our skins to direct sunlight which has not passed through window-glass. Not enough is yet known about its occurrence to include it in the table.

There is at least one other vitamin, one affecting reproduction. However, little is known about it yet.

How to Read This Table

If a single + is found opposite a food material in, for example, the Vitamin A column, it means that this food material contains some of this vitamin; if a double plus, ++, that the food contains more of it; if a triple plus, +++, that the food contains an especially large amount. On the other hand, a – means that the vitamin is not found in the food in any appreciable amount. A question mark means that we do not yet know whether the vitamin is present or not. If the question mark appears after a + or –, the + or – shows what is considered probable. If a V occurs, it means that the amount of the vitamin has been found to vary. For example, the amount of Vitamin C in milk varies with the feed, the breed of cow, and so forth.

TABLE SHOWING RELATIVE AMOUNTS OF VITAMINS[1]

KIND OF FOOD	VITAMIN A	VITAMIN B	VITAMIN C
Beverages			
Buttermilk	+	++	+V
Grape juice	+	+ to ++	+?
Milk whole, raw, "scalded", condensed, or dried . . .	+++	++	+V
Evaporated	+++	++	−?
Skim	+	++	+V
Bread			
White, yeast, water . . .	?	+	−
White, yeast, milk	+	+	− to +
Whole wheat, yeast, water .	+	++	?
Whole wheat, yeast, milk .	++	++	− to +
Butter			
See Fats			
Cereals			
Barley, whole	+	++	−
Bran, wheat	+	++?	−
Corn, white	+	++	−
Corn, yellow	++	++	−
Corn meal	− to +	−	−
Cornstarch	−	−	−
Flour, white	−	− to +	−
Flour, whole wheat	+	++	−
Rice, white, polished . . .	−	−	−
Rice, whole grain	+	++	−
Rye	+	++	−
Cheese			
Full milk	++ to +++	−?	?
Cottage, skim milk	+	?	?
Cream	+++	++	+V

[1] Since vitamins are at present under very active investigation, it is necessary to be sure one is using as recent a table as possible for information on this subject. Many food materials have not yet been studied for their exact vitamin content.

TABLE SHOWING RELATIVE AMOUNTS OF VITAMINS
(Continued)

KIND OF FOOD	VITAMIN A	VITAMIN B	VITAMIN C
Eggs			
Whole	+++	+ to ++	– ?
White	–	?	– ?
Yolk	+++	++	– ?
Fats			
Bacon	– to +	+ to ++	?
Beef fat	++	–	–
Butter	+++	–	–
Cod liver oil	+++	–	–
Corn oil	+	–	–
Cottonseed oil	?	–	–
Lard	– to +	–	–
Nut margarine, vegetable fat	–	–	–
Oleomargarine, animal fat	– to ++	–	–
Olive oil	– to +	–	–
Peanut oil	?	–	–
Fish			
Fish, fat	+	+	?
Fish, lean	– to +	+	?
Fish roe	++	++	?
Oysters	?	?	+
Salmon, canned	+	?	?
Fruits			
Apples, raw	+	+ to ++	++
Bananas, raw	+ to ++	+ to ++	++
Cantaloupe	++	++	?
Grapes	+	+ to ++	+
Grapefruit	+	++	+++
Lemon juice	+	++	+++
Limes	?	?	++
Orange juice	+	++	+++
Peaches, fresh	+	+ to ++	++
Pears, fresh	?	+	?
Pineapples, fresh, raw	++	++	++
Pineapples, canned	++	++	++ ?

TABLE SHOWING RELATIVE AMOUNTS OF VITAMINS
(*Continued*)

Kind of Food	Vitamin A	Vitamin B	Vitamin C
Prunes	++	++	–
Raisins	–	+	–
Rhubarb	?	?	+
Strawberries	?	+	+ to ++
Meats			
Beef	+	++	– to +
Beef juice	?	+	– to +
Ham	– to +	++	–
Heart	+	++	+ ?
Kidney	++	++	+ ?
Liver	++ to +++	++	+
Meat, canned	– to +	+	–
Meat, extract	–	– ?	–
Mutton	– to +	++	?
Pork	– to +	+++ ?	–
Sweetbread (thymus)	+	+	?
Veal	– to +	+ ?	?
Nuts			
Almonds	+	++	?
Brazil nuts	+	++	?
Chestnuts	?	+	?
Cocoanut	+	++	?
Hickory nuts	?	++	?
Peanuts	+	++	?
Peanut butter	+	++	?
Pecans	+	+	?
Walnuts	+	++	?
Sugars			
Glucose	–	–	–
Honey	–	+ ?	–
Molasses	–	+	?
Sugar	–	–	–
Vegetables			
Asparagus	?	+++ ?	?
Beans, kidney	+	+++	?

TABLE SHOWING RELATIVE AMOUNTS OF VITAMINS
(*Continued*)

KIND OF FOOD	VITAMIN A	VITAMIN B	VITAMIN C
Beans, navy	+	+++	?
Beans, soy	+	+++	?
Beans, string, cooked	++	++	?
Beets	+	+	+
Beet leaves	++	++	?
Beet stems	?	+	?
Cabbage, fresh, raw	+ to ++	++	+++
Cabbage, cooked	+	++	+
Carrots, fresh, young	+++	++	++
Carrots, old, raw	+++	++	+
Cauliflower	+	++	+
Celery, bleached	− to +	++	?
Celery leaves bleached	+	++	?
Celery leaves green	++	++	?
Cucumbers	− to +	+	++ ?
Dasheens	?	+	+
Egg plant	+	+	?
Endives	+	?	+
Greens			
Beet greens	++	++	?
Chard	++	+ to ++	?
Cress	?	?	+
Dandelion	++	++	+
Kale	++	?	?
Lentils, dry	+	++ to +++	− ?
Lettuce	+ to ++	++	+++
Mushrooms	−	++	−
Onions, raw	− to +	+	++
Onions, cooked	− to +	+	+
Parsley	?	++	?
Parsnips	− to +	++	?
Peas, dry	+	++	?
Peas, young green	++	++	+++
Peppers	++	?	?
Potatoes, sweet	++	++	+

Table Showing Relative Amounts of Vitamins
(Continued)

Kind of Food	Vitamin A	Vitamin B	Vitamin C
Potatoes, white, boiled			
15 minutes	+	++	++
1 hour	+	++	+
Potatoes, white, baked	+	++	+ to ++ ?
Radishes	− to +	+	?
Romaine	++	++	?
Rutabaga	− to +	++	+++ ?
Sauerkraut	+	+	− ?
Spinach, cooked	+++	+++	+
Squash, Hubbard	++	?	?
Swedes	?	++	+++ ?
Tomatoes, raw	++	++	+++
Tomatoes, canned	++	++	+++
Tomatoes, dried	++	++	++
Turnips, white	− to +	++	++
Yeast	−	+++	−

II. Tables of Height and Weight

For Men

Symond's Table of Height and Weight for Men at Different Ages

Ages	15–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69
5 ft. 0 in.	120	125	128	131	133	134	134	134	131	
1 in.	122	126	129	131	134	136	136	136	134	
2 in.	124	128	131	133	136	138	138	138	137	
3 in.	127	131	134	136	139	141	141	141	140	140
4 in.	131	135	138	140	143	144	145	145	144	143
5 in.	134	138	141	143	146	147	149	149	148	147
6 in.	138	142	145	147	150	151	153	153	153	151
7 in.	142	147	150	152	155	156	158	158	158	156
8 in.	146	151	154	159	160	161	163	163	163	162
9 in.	150	155	159	162	165	166	167	168	168	168
10 in.	154	159	164	167	170	171	172	173	174	174
11 in.	159	164	169	173	175	177	177	178	180	180
6 ft. 0 in.	165	170	175	179	180	183	182	183	185	185
1 in.	170	177	181	185	186	189	188	189	189	189
2 in.	176	184	188	192	194	196	194	194	192	192
3 in.	181	190	195	200	203	204	201	198		

For Women

Symond's Table of Height and Weight for Women at Different Ages

Ages	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64
4 ft. 11 in.	111	113	115	117	119	122	125	128	128	126
5 ft. 0 in.	113	114	117	119	122	125	128	130	131	129
1 in.	115	116	118	121	124	128	131	133	134	132
2 in.	117	118	120	123	127	132	134	137	137	136
3 in.	120	122	124	127	131	135	138	141	141	140
4 in.	123	125	127	130	134	138	142	145	145	144
5 in.	125	128	131	135	139	143	147	149	149	148
6 in.	128	132	135	137	143	146	151	153	153	152
7 in.	132	135	139	143	147	150	154	157	156	155
8 in.	136	140	143	147	151	155	158	161	161	160
9 in.	140	144	147	151	155	159	163	166	166	165
10 in.	144	147	151	155	159	163	167	170	170	169

In adult life, it is well to weigh slightly less than average. Some authorities state that one should never weigh more than the proper weight at thirty.

For Girls

(Table Prepared by Drs. Thomas D. Wood and Bird T. Baldwin)

Height Inches	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
38	33	33												
39	34	34												
40	36	36	36											
41	37	37	37											
42	39	39	39											
43	41	41	41	41										
44	42	42	42	42										
45	45	45	45	45	45									
46	47	47	47	48	48									
47	49	50	50	50	50	50								
48		52	52	52	52	53	53							
49		54	54	55	55	56	56							
50		56	56	57	58	59	61	62						
51			59	60	61	61	63	65						
52			63	64	64	64	65	67						
53			66	67	67	68	68	69	71					
54				69	70	70	71	71	73					
55				72	74	74	74	75	77	78				
56					76	78	78	79	81	83				
57					80	82	82	82	84	88	92			
58						84	86	86	88	93	96	101		
59						87	90	90	92	96	100	103	104	
60						91	95	95	97	101	105	108	109	111
61							99	100	101	105	108	112	113	116
62							104	105	106	109	113	115	117	118
63								110	110	112	116	117	119	120
64								114	115	117	119	120	122	123
65								118	120	121	122	123	125	126
66									124	124	125	128	129	130
67									128	130	131	133	133	135
68									131	133	135	136	138	138
69										135	137	138	140	142
70										136	138	140	142	144
71										138	140	142	144	145

Courtesy of American Child Health Association

To find weight remove outdoor clothing and shoes.

To find height, stand in erect position with heels and shoulders against the wall. Take height by placing a square wooden box (a chalk box will serve) on top of the head and one side against the wall.

To find age, count from the nearest birthday.

For Boys

(Table Prepared by Drs. Thomas D. Wood and Bird T. Baldwin)

Ht. Ins.	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.	19 Yrs.
38	34	34													
39	35	35													
40	36	36													
41	38	38	38												
42	39	39	39	39											
43	41	41	41	41											
44	44	44	44	44											
45	46	46	46	46	46										
46	47	48	48	48	48										
47	49	50	50	50	50	50									
48		52	53	53	53	53									
49		55	55	55	55	55	55								
50		57	58	58	58	58	58	58							
51			61	61	61	61	61	61							
52			63	64	64	64	64	64	64						
53			66	67	67	67	67	68	68						
54				70	70	70	70	71	71	72					
55				72	72	73	73	74	74	74					
56				75	76	77	77	77	78	78	80				
57					79	80	81	81	82	83	83				
58					83	84	84	85	85	86	87				
59						87	88	89	89	90	90	90			
60						91	92	92	93	94	95	96			
61							95	96	97	99	100	103	106		
62							100	101	102	103	104	107	111	116	
63							105	106	107	108	110	113	118	123	127
64								109	111	113	115	117	121	126	130
65								114	117	118	120	122	127	131	134
66									119	122	125	128	132	136	139
67									124	128	130	134	136	139	142
68										134	134	137	141	143	147
69										137	139	143	146	149	152
70										143	144	145	148	151	155
71										148	150	151	152	154	159
72											153	155	156	158	163
73											157	160	162	164	167
74											160	164	168	170	171

Courtesy American Child Health Association

See directions accompanying Table for Girls on preceding page. In taking the weight of boys, the coat should be removed also.

For Little Children [1]

Age	Boys		Girls	
	Average Height (Inches)	Average Weight (Pounds)	Average Height (Inches)	Average Weight (Pounds)
Under 1 month	21 1/8	9 1/8	20 7/8	8 5/8
6 months, under 7 . . .	26 3/4	17 1/2	26 1/8	16 1/4
1 year, under 13 mos. . .	29 1/2	21 3/8	28 7/8	20
2 years, under 25 mos. .	33 3/5	26 5/8	33 1/8	25 1/8
3 years, under 37 mos. .	36 5/8	30 3/4	36 1/4	29 1/2
4 years, under 49 mos. .	39 1/4	34 1/2	38 7/8	33 1/8
5 years, under 61 mos. .	41 5/8	38 1/8	41 3/8	36 7/8

Weights do not include clothing.

[1] Figures published by U. S. Children's Bureau, based on measurements of 167,024 white children for whom no serious diseases or defects were reported.

III. Approximate Calorie Values of Food

The following table shows the rough measure of servings of common foods. Since prepared foods differ markedly in calorie value according to the recipes used, this is obviously only a rough means of estimating the calories in a given portion of food, so it has seemed sufficiently accurate to state the calories in round numbers.

How to Use This Table

Suppose you wish to find the calorie value of a breakfast and the calories from protein. Put down the amounts eaten and find in the table the nearest amount to be used. Then make the proper adjustment, and add the results.

Example	Calories from Protein	Total Cal.
1 glass of milk	34	170
½ c. oatmeal (⅔ amount in table)	8	50
¼ c. top milk	9	100
1 tbsp. sugar	0	55
2 slices bacon	9	75
1 slice toast, baker's bread (½ amount in table)	7	50
½ tbsp. butter (½ amount in table)	½	50
Totals	67½	550

Table of Approximate Calorie Values of Average Servings and Common Measures

Name of Food	Amount of Serving	Actual Weight Oz.	Approximate Number of Calories from Protein	Approximate Number of Total Calories
Beverages				
Buttermilk	1 cup (½ pt.)	8.8	30	90
Chocolate				
Half milk, sweetened	¾ cup	6.8	18	165
Cocoa powder	1 tsp.	.08	2	10
Cocoa				
Half milk, sweetened	¾ measuring	6.8	17	120
Coffee, clear			0	0
Grape juice	½ cup	3.5	0	100
Milk, whole	1 cup (Large glass)	8.5	31	160
Bread				
Baking-powder biscuit	2 small	1.3	11	100
Boston Brown Bread	1 slice, ¾″ thick and 3″ diameter	1.8	10	100
Corn bread	Slice 2″ x 4″ x 1	2.4	20	200
Crumbs, stale	1 cup	3.0	34	240
Crumbs, soft	1 cup	2.0	21	145
Graham bread				
Bakers'	1 medium slice	.7	7	50
Home-made	1 medium slice	1.5	14	100
Muffins				
Corn meal	1 muffin	1.6	17	135
Graham	1 muffin	1.9	17	135
Plain ("one egg")	1 muffin	1.5	15	120
Popovers	1 popover	2.0	18	100
Rolls	1 roll	1.3	12	100
Rye bread				
Home-made	1 medium slice	1.5	14	100
White bread				
Bakers'	1 medium slice	0.7	7	50
Home-made	1 medium slice	1.3	14	100
Whole wheat bread				
Bakers'	1 medium slice	0.7	8	50
Butter				
See Fats				
Bran	1 tbsp.	0.2	2	15
Cereals				
Cornflakes	¾ cup	0.6	4	60
Corn meal				
Raw	1 tbsp.	0.3	3	35
Raw	1 cup	5.0	52	505
Cooked	¾ cup	6.8	11	110
Cornstarch	1 tbsp.	0.3	0	35
Cornstarch	1 cup	4.5	0	460
Cream of wheat or Farina	¾ cup	6.0	12	100

Table of Approximate Calorie Values (*Continued*)

Name of Food	Amount of Serving	Actual Weight Oz.	Approximate Number of Calories from Protein	Approximate Number of Total Calories
Cereals (*Continued*)				
Flour				
Graham	1 cup	5.0	75	510
Rye	1 cup	5.0	38	495
White, unsifted	1 cup	4.5	58	460
White, unsifted	1 tbsp.	0.3	4	35
Whole wheat	1 cup			
Grapenuts	3 tbsp.	1.0	12	100
Hominy grits, cooked	¾ cup	6.4	8	95
Oatmeal, cooked	¾ cup	6.0	12	75
Rice				
Puffed	¾ cup	0.6	5	60
Raw	1 tbsp.	0.5	4	50
Steamed	¾ cup	4.0	9	100
Shredded wheat	1 biscuit	1.0	13	100
Cakes				
Angel Cake	Piece 2″ x 2″ and 2″ thick	2.2	20	160
Chocolate cake	Piece 3″ x 4″ and 1″ thick	1.9	11	210
Cookies, plain	1 cooky 2¼″ diameter	0.5	3	50
Doughnuts	1 doughnut	1.6	12	200
Frosting, boiled	1 tbsp.	0.2	0	20
Gingerbread	1 piece, 2″ x 4″ and 2″ thick	5.3	34	485
Plain cake "One egg"	1 piece about 3″ x 4″ and 1″ thick	3.0	24	300
Sponge cake				
"Hot water"	1 piece, 3″ x 4″ and 1″ thick	2.2	17	240
True	As above	2.4	29	270
Candy				
Chocolate, bitter	1 square	1.0	15	175
Fudge	1″ x 1″ and ½″ thick	0.4	1	45
Sweet	Small bar	2.0	21	320
Stick candy	1 stick, 6″ long and ⅜″ diameter	0.6	0	65
Cheese				
American, fresh	1″ cube	0.6	20	75
American, dry	1 tbsp. (grated)	0.1	4	15
Cottage	3 tbsp.	1.4	35	50
Crackers				
Graham	1 cracker	0.4	5	50
Oyster	1 doz.	0.4	5	50
Saltines	1 cracker	0.1	1	15
Soda	1 cracker	0.2	2	25

Table of Approximate Calorie Values (*Continued*)

Name of Food	Amount of Serving	Actual Weight Oz.	Approximate Number of Calories from Protein	Approximate Number of Total Calories
Cream				
Thin	¼ cup	2.0	6	110
	1 tbsp.	0.5	1	30
Thick	¼ cup	1.9	5	210
	1 tbsp.	0.7	1	70
Whipped, sweetened . .	2 tbsp.	0.9	2	100
Desserts				
Apple pie	⅙ pie, 9″ diameter	4.7	11	305
Apple tapioca	½ cup	7.2	2	200
Bread pudding, with raisins	½ cup	4.0	12	135
Brown Betty	½ cup	5.1	9	250
Chocolate blanc mange .	½ cup	4.2	18	215
Cornstarch blanc mange	½ cup	4.9	16	185
Custard				
"Cup" — baked . .	½ cup	4.8	25	145
Soft	½ cup	3.8	22	175
Ice cream (with egg) . .	½ cup	4.0	12	200
Lemon ice	½ cup	3.9	0	120
Lemon jelly	½ cup	4.2	10	110
Lemon pie with meringue	⅙ pie	4.5	23	450
Snow pudding without custard	½ cup	1.7	7	75
Tapioca cream . . .	½ cup	3.7	15	130
Eggs				
Whole	1 medium	2.5	25	70
	1 white	1.0	13	15
	1 yolk	0.6	11	55
Scrambled	½ cup	4.2	40	200
Fats				
Butter	1 tbsp.	0.5	0	110
	1 tsp.	0.2	0	35
Oleo	1 tbsp.	0.5	0	105
	1 tsp.	0.2	0	35
Olive oil	1 tbsp.	0.4	0	100
See also Cream				
Fish				
Codfish balls	2 balls, 2″ diameter	3.4	28	195
Creamed codfish . . .	½ cup	2.5	32	100
Creamed salmon on toast	½ cup of salmon and 1 slice toast	5.0	46	210
Halibut	1 serving	4.0	81	135
Salmon				
Creamed on toast . .	½ cup and 1 slice toast	4.8	44	200

TABLE OF APPROXIMATE CALORIE VALUES (*Continued*)

NAME OF FOOD	AMOUNT OF SERVING	ACTUAL WEIGHT Oz.	APPROXIMATE NUMBER OF CALORIES FROM PROTEIN	APPROXIMATE NUMBER OF TOTAL CALORIES
Fish; Salmon (*Continued*)				
Loaf	½ cup	4.2	74	200
Sardines	3 small	0.9	23	50
Fruit				
Apples, fresh	1 medium	5.6	2	75
Apples, baked	1 large	4.5	3	200
Apple sauce	½ cup	4.6	2	135
Apricots				
Canned				
Stewed	½ cup	5.4	8	200
Bananas	1 large	5.5	5	100
Blackberries				
Fresh	1 cup	12.2	18	100
Stewed	½ cup	4.4	4	200
Cantaloupe	½ mellow, 4½″ in diameter	9.0	3	50
Currants, dried	½ cup	2.7	8	250
Dates	6 to 8	2.2	4	200
Figs	3 medium	1.5	7	135
Grapefruit	½ medium	7.6	7	100
Grapes, Concord	1 large bunch	5.0	5	100
Lemons	1 lemon	3.8	3	35
Olives, green	2 to 3	0.5	0	35
Oranges	1 medium	6.3	4	65
Peaches				
Fresh	1 medium	3.5	2	35
Canned	1 large half 1½ tbsp. juice	3.8	2	50
Pears				
Canned	½ and 1 tbsp. juice	1.6	1	35
Fresh	1 medium	3.2	2	50
Pineapple				
Canned	1 slice with 3 tbsp. juice or ¼ cup shredded	2.3	1	100
Fresh	1 slice, 1″ thick	4.1	2	50
Plums, fresh	3–4	4.4	5	100
Prunes				
Dried	4 medium	1.4	3	100
Stewed with sugar	6 prunes and 6 tbsp. juice	8.4	6	300
Raisins	¼ cup	1.1	3	100
Rhubarb	½ cup	1.7	1	100
Strawberries	1 cup	6.8	8	75
Gelatin				
Granulated	1 tbsp.	.3	35	35
See also Desserts				

Table of Approximate Calorie Values (*Continued*)

Name of Food	Amount of Serving	Actual Weight Oz.	Approximate Number of Calories from Protein	Approximate Number of Total Calories
Gravy and Sauces for meats				
Brown gravy . . .	1 tbsp.	0.6	2	20
Tomato sauce . . .	1 tbsp.	0.5	1	20
White sauce	¼ cup	2.5	10	105
For desserts				
Hard sauce	1 tbsp.	0.7	0	100
Lemon sauce . . .	1 tbsp.	0.8	0	50
Meats				
Bacon	2 slices	0.5	9	75
Beef, corned, with fat .	1 slice, 4½" x 1½" and about ½" thick	2.0	42	200
Beef heart, stuffed . .	1 slice, 4" diameter and ½" thick	3.0	63	300
Beef loaf	1 slice, 4" x 3" and ½" thick	2.8	80	200
Beef pie	⅙ of a pie, 8" diameter, 3½" deep	6.8	40	380
Beef, roast, ribs lean . .	1 slice, 5" x 2½" and ¼" thick	1.6	46	100
Beef stew, with vegetables	1 cup	7.2	40	250
Chicken, creamed . .	½ cup	3.6	36	220
Chicken, roast	1 slice, 2" x 2½" and ¼" thick	0.2	26	50
	2 thin slices, 4" x 2½"	0.5	17	25
Dried beef, creamed . .	½ cup	4.0	35	175
Hamburg steak . . .	2 cakes, 2½" diameter, and ⅞" thick	4.0	110	200
Lamb, chops	1 chop, 2" x 2" and 1" thick	3.2	80	200
Lamb leg, roast . . .	1 slice, 3" x 4" and ¼" thick	2.7	62	150
Lamb stew, with vegetables	1 cup	8.5	34	175
Lamb stew, with vegetables and dumplings .	1 cup and 1 dumpling	7.6	48	400
Pork chops	1 large	2.4	92	250
Poultry stuffing . . .	½ cup	1.3	15	155
Sausage, cooked . . .	2 small, about 3" long	1.1	20	100
Frankfurters . . .	1 sausage	1.1	31	100
Steak, broiled				
Round, lean	1 piece, 4" x 3" and 1" thick	1.8	42	90
Sirloin, moderately fat	1 piece, 3" x 2" and 1" thick	3.9	93	300

TABLE OF APPROXIMATE CALORIE VALUES (*Continued*)

Kind of Food	Amount of Serving	Actual Weight Oz.	Approximate Number of Calories from Protein	Approximate Number of Total Calories
Meats (*Continued*)				
Veal cutlets, breaded	1 serving	5.6	85	285
Veal roast, shoulder	1 serving	3.0	99	150
Meat substitutes				
Cheese soufflé	½ cup	1.7	18	100
Kidney bean stew	1 cup	9.8	52	200
Macaroni, cooked	1 cup	5.2	15	100
Macaroni, with cheese	1 cup	4.2	34	200
Macaroni, with tomato sauce	1 cup	8.3	24	225
Turkish pilaf	1 cup	7.5	9	100
Welsh rabbit	3 tbsp. and 1 slice toast	2.6	44	200
See also Eggs and Fish				
Milk				
Skim	1 cup	8.5	33	90
Top	½ cup	2.1	9	150
Whole	1 cup	8.5	34	170
Whole	1 tbsp.	0.7	3	10
See also Cream and Beverages				
Molasses				
See Sugar				
Oleomargarine				
See Fats				
Olive oil				
See Fats				
Nuts				
Almonds	10–15 nuts	0.5	13	100
Coconut, desiccated	1 tbsp.	0.2	1	35
Peanuts	20–25 single nuts	0.6	19	100
Peanut butter	1 tbsp.	0.7	23	120
Walnuts, English, shelled	8 halves of medium size	0.5	11	100
Pie				
See Desserts				
Puddings				
See Desserts				
Rolls				
See Bread				
Salads and Dressings				
Banana salad	1 leaf lettuce, ½ banana, ½ tbsp. boiled dressing	2.9	13	110
Boiled dressing	1 tbsp.	0.7	3	25

TABLE OF APPROXIMATE CALORIE VALUES (*Continued*)

KIND OF FOOD	AMOUNT OF SERVING	ACTUAL WEIGHT *Oz.*	APPROXIMATE NUMBER OF CALORIES FROM PROTEIN	APPROXIMATE NUMBER OF TOTAL CALORIES
Chicken salad	½ cup chicken, ¼ cup celery, 1 tbsp. French dressing, 1 tbsp. mayonnaise, 2 lettuce leaves	3.5	28	230
Coleslaw	½ cup, sour cream dressing	1.4	3	50
Egg salad	1 egg, 2 leaves lettuce, mayonnaise	3.3	33	230
French dressing	1 tbsp.	0.4	0	70
Fruit salad	½ cup and 1 tbsp. mayonnaise	3.0	6	200
Lettuce, plain	5 leaves of "leaf lettuce"	1.0	1	5
Lettuce with French dressing	1 serving	1.2	1	100
Mayonnaise with oil	1 tbsp.	0.5	1	100
Potato salad	½ large potato, 1½ tbsp. mayonnaise, 3 small leaves lettuce	3.7	7	210
Tomato salad with mayonnaise	¾ tomato, lettuce, and mayonnaise	5.4	6	200
Tomato salad with French dressing	1 serving	4.5	3	170
Waldorf salad	½ apple, 3 walnuts, ¼ cup mayonnaise	3.3	11	260
Soups				
Bouillon	¾ cup		15	20
Corn chowder (all milk) with crackers	¾ cup		23	190
Cream of				
Celery (half milk)	¾ cup		16	125
Green pea (half milk)	¾ cup		20	150
Spinach (half milk)	¾ cup		16	125
Tomato (two-thirds milk)	¾ cup		22	150
Oyster stew (without crackers)	¾ cup		24	145
Potato (all milk)	¾ cup		24	160
Split pea soup (without milk)	¾ cup		30	115
Tomato				
Canned	¾ cup		12	100
Creole	¾ cup		6	80
Vegetable	¾ cup		18	25

TABLE OF APPROXIMATE CALORIE VALUES (*Continued*)

KIND OF FOOD	AMOUNT OF SERVING	ACTUAL WEIGHT Oz.	APPROXIMATE NUMBER OF CALORIES FROM PROTEIN	APPROXIMATE NUMBER OF TOTAL CALORIES
Sugar and sweets				
Cranberry jelly	1 tbsp.	0.8	0	50
Cranberry sauce	¼ cup	1.5	0	100
Honey	1 tbsp.	1.1	1	100
Maple sugar	1 tbsp.	0.8	0	75
Maple syrup	1 tbsp.	0.8	0	0
Molasses	1 cup	12.0	33	975
	1 tbsp.	0.8	2	65
Sugar	1 cup	7.4	0	840
	1 tbsp.	0.5	0	55
	1 tsp.	0.2	0	20
Vegetables				
Asparagus, fresh	5 stalks, 8″ long	4.0	8	25
Asparagus, canned, on toast, white sauce	5 stalks, 1 slice toast, ¼ c. white sauce	7.7	23	170
Beets	2 beets, 2″ diameter or ¾ c. sliced	3.9	7	50
Cabbage, cooked	1 c. shredded, before cooking	4.0	7	35
See Coleslaw				
Carrots	2 small, about ¾″	5.0	5	50
Cauliflower	¼ medium (1 lb.) head	3.0 raw	6	25
Celery	2 pieces, 6″ long and 1″ wide or ¼ c. cut in ¼″ pieces	1.0	1	5
Coleslaw	½ cup	1.4	3	50
Corn, on cob	1 ear, 6″ long	4.5	6	50
Corn, canned	½ cup	5.4	17	150
Corn pudding or (à la Southern)	½ cup	5.1	24	150
Cucumbers	9 slices medium thick	1.5	1	5
Lettuce				
See Salads				
Lima beans, buttered	½ cup	3.5	30	200
Onions, boiled	2 onions	5.0	10	100
Onions, scalloped	½ cup	3.8	12	150
Parsnips, stewed	1 serving	5.8	10	100
Peas, fresh, shelled	½ cup	2.3	21	65
Peas, canned	½ cup, drained	2.9	18	65
Peas, creamed	½ cup	3.1	20	110
Peppers, stuffed with rice, tomato, and onions	1 pepper	6.1	9	90

Table of Approximate Calorie Values (*Continued*)

Kind of Food	Amount of Serving	Actual Weight Oz.	Approximate Number of Calories from Protein	Approximate Number of Total Calories
Potatoes, sweet				
Baked	1 potato	5.2	12	200
Glazed	2 halves	6.0	10	250
Potatoes, white				
Baked	1 medium	3.0	11	100
Boiled	1 medium	3.6	11	100
Browned	1 medium	3.5	11	125
Chips	8–10 large pieces	0.6	5	100
Mashed	½ cup	3.5	8	115
Scalloped	½ cup	2.9	8	80
Scalloped with cheese	½ cup	3.2	12	100
Radishes	4 red button	1.3	2	10
Spinach, boiled	½ cup	4.2	2	20
Spinach, creamed	½ cup	3.6	8	80
String beans, plain	½ cup	0.2	5	25
Succotash, canned	½ cup	5.2	23	150
Tomatoes, canned	1 cup	4.5	6	30
Tomatoes, fresh	1 medium	7.7	8	50
Turnips, creamed	½ cup	1.4	10	100
Turnips, mashed	½ cup	4.5	6	75

IV. The Cost of 100-Calorie Portions of Food

How to Use This Table

To find the cost in cents of a portion of food which will furnish one hundred calories, multiply the cost of the food in pounds or quarts or dozens by the decimal opposite that food in the table.

For example:

Suppose we wish to find the cost of a hundred-calorie portion of milk at fifteen cents a quart to compare it with the cost of a hundred-calorie portion of round steak at thirty cents a pound. The factor for milk is 0.148, to be multiplied by the cost of a quart, or 15, which equals 2.2. The factor for round steak is 0.153, to be multiplied by the cost per pound, or 30, which equals 4.6. This

shows that the hundred-calorie portion of milk at this price costs two and two-tenths cents, while the hundred-calorie portion of meat at this price costs four and six-tenths cents. At these prices, then, milk is less than half as expensive a food as round steak, from the standpoint of their total food value.

Warning

In considering the actual value of any food, we must consider also its composition. For example, we must not compare such a food as sugar with milk on the basis of total calories, for sugar is lacking in protein, mineral matter, and vitamins, but we may wisely compare the value of one kind of meat with another.

How the Factor Is Determined

If the commodity is sold by the pound, the factor in Column II is obtained by dividing one cent by the number of 100-calorie portions in one pound. This is equivalent to dividing 100 by the fuel value per pound.

When the commodity is not sold by the pound, the factor is obtained by dividing one by the weight, expressed in pounds, of the quart, peck, or dozen, and then dividing that by the number of 100-calorie portions in a pound.

Table of Factors for Use in Finding the Cost of 100-Calorie Portions of Food

Name of Food	Factor to Be Multiplied by Price to Obtain Cost of 100-Calorie Portion, Expressed in Cents
Berries	
Blackberries [1]	0.278†
Cranberries	0.472*
Currants [1]	0.280 [1]
Raspberries [1], red	0.294 [1]
Strawberries [1]	0.432 [1]
Bread	
Boston Brown	0.097*
Graham	0.084*
Rye	0.087*
White	0.085*
Whole wheat	0.090*
Butter (*see* Fats)	
Cereals (*see also* Bread)	
Barley, Pearl	0.062*
Corn meal	0.062*
Corn flakes	0.061*
Cornstarch	0.061*
Cream of wheat	0.061*
Flour, barley	0.062*
Flour, buckwheat	0.063*
Flour, Graham	0.061*
Flour, rye	0.063*
Flour, white	0.062*
Flour, whole wheat	0.061*
Grapenuts	0.059*
Hominy, uncooked	0.062*
Macaroni	0.062*

[1] Calculated on the basis that one quart of berries weighs 22 ounces.

* Multiply by cost per pound. † Multiply by cost per quart.

TABLE OF FACTORS FOR USE IN FINDING THE COST OF 100-CALORIE PORTIONS OF FOOD (*Continued*)

NAME OF FOOD	FACTOR TO BE MULTIPLIED BY PRICE TO OBTAIN COST OF 100-CALORIE PORTION, EXPRESSED IN CENTS
Cereals (*Continued*)	
Noodles	0.062*
Oatmeal, Rolled Oats	0.056*
Oatmeal, steel cut	0.055*
Popcorn	0.055*
Rice	0.063*
Shredded wheat	0.060*
Tapioca, Minute	0.062*
Cheese (*see* Dairy Products)	
Chocolate *and* Cocoa (*see* Sweets)	
Crackers	
Boston crackers	0.054*
Graham crackers	0.052*
Oatmeal crackers	0.052*
Oyster crackers	0.052*
Saltines	0.051*
Soda crackers	0.053*
Water crackers	0.056*
Cream (*see* Dairy Products)	
Dairy Products	
Butter (*see* Fats)	
Buttermilk [1]	0.278†
Cheese, American	0.050*
Condensed milk, sweetened	0.068*
Condensed milk, unsweetened	0 132*
Cream, thin [2] (18%)	0.058†

[1] Calculated on the basis that 1 qt. of buttermilk weighs 2 lb. 2.6 oz. or 980 g.

[2] Calculated on the basis that 1 qt. of thin cream weighs 1 lb. 15.6 oz. or 896 g.

* Multiply by cost per pound. † Multiply by cost per quart.

TABLE OF FACTORS FOR USE IN FINDING THE COST OF 100-CALORIE PORTIONS OF FOOD (*Continued*)

NAME OF FOOD	FACTOR TO BE MULTIPLIED BY PRICE TO OBTAIN COST OF 100-CALORIE PORTION, EXPRESSED IN CENTS
Dairy Products (*Continued*)	
Cream, thick [1] (40%)	0.029†
Skimmed milk [2]	0.278†
Whole milk [3]	0.148†
Eggs without shell [4]	0.114‡
Fats (*see* Oils)	
Butter	0.029*
Cottolene	0.024*
Cotton-seed oil	0.013*
Lard	0.024†
Oleomargarine	0.029*
Olive oil [5]	0.013†
Salt pork	0.028*
Suet, beef	0.029*
Fish	
Bluefish	0.485*
Codfish, steaks	0.304*
Codfish, salt	0.194*
Halibut	0.219*
Herring, smoked	0.137*

[1] Calculated on the basis that 1 qt. of thick cream weighs 1 lb. 15 oz. or 880 g.

[2] Calculated on the basis that 1 qt. of skimmed milk weighs 2 lb. 2.6 oz. or 980 g.

[3] Calculated on the basis that 1 qt. of whole milk weighs 2 lb. 2.4 oz. or 976 g.

[4] Calculated on basis that 1 doz. eggs without shell weighs 1 lb. 5 oz. or 50 g. per egg.

[5] Calculated on the basis that 1 qt. of oil weighs 1 lb. 14.6 oz

* Multiply by cost per pound. † Multiply by cost per quart.

‡ Multiply by cost per dozen.

TABLE OF FACTORS FOR USE IN FINDING THE COST OF 100-CALORIE PORTIONS OF FOOD (*Continued*)

NAME OF FOOD	FACTOR TO BE MULTIPLIED BY PRICE TO OBTAIN COST OF 100-CALORIE PORTION, EXPRESSED IN CENTS
Fish (*Continued*)	
Lobster, canned	0.262*
Oysters [1]	0.300*
Salmon, fresh	0.172*
Salmon, canned	0.152*
Sardines	0.108*
Tuna	0.179*
Whitefish	0.314*
Flour (*see* Cereals)	
Fruit (*see* Berries)	
Apples, fresh [2]	0.037¶
Apples, dried	0.076*
Apricots, dried	0.079*
Bananas	0.345*
Cherries, candied	0.063*
Cherries, canned	0.246*
Citron	0.067*
Currants, dried	0.069*
Dates, dried	0.071*
Figs, dried	0.070*
Grapes	0.051*
Lemons [3]	0.286‡
Olives [4]	0.067†
Oranges [5]	0.148‡

[1] Calculated on basis that 1 qt. of oysters weighs 1 lb. 8 oz.
[2] Calculated on basis that 1 pk. of apples weighs 12½ lb.
[3] Calculated on basis that 1 doz. lemons weigh 2 lb. 8 oz.
[4] Calculated on basis that 1 qt. olives weighs 1 lb. 8 oz.
[5] Calculated on the basis that 1 doz. medium oranges weigh 4 lb.
* Multiply by cost per pound. † Multiply by cost per quart.
‡ Multiply by cost per dozen. ¶ Multiply by cost per peck.

TABLE OF FACTORS FOR USE IN FINDING THE COST OF 100-CALORIE PORTIONS OF FOODS (*Continued*)

NAME OF FOOD	FACTOR TO BE MULTIPLIED BY PRICE TO OBTAIN COST OF 100-CALORIE PORTION, EXPRESSED IN CENTS
Fruit (*Continued*)	
Peaches, fresh[1]	0.217‡
Peaches, canned	0.469*
Pears, fresh	0.408*
Pears, canned	0.290*
Pineapple, canned	0.144*
Prunes	0.086*
Raisins, seeded	0.064*
Raisins, layer	0.071*
Rhubarb	1.613*
Watermelon	1.754*
Gelatin	0.060*
Meats:	
Bacon	0.039*
Beef, dried	0.132*
Beef, heart	0.078*
Beef, liver	0.186*
Porterhouse steak	0.093*
Beef, rib, roast	0.093*
Beef, round, lean	0.153*
Beef, sirloin	0.104*
Beef, tenderloin	0.078*
Beef, tongue	0.189*
Chicken, young	0.346*
Fowl	0.133*
Ham, deviled	0.057*
Ham, fresh	0.077*
Ham, smoked	0.062*

[1] Calculated on the basis that 1 doz. peaches weigh 3 lb.

* Multiply by cost per pound. ‡ Multiply by cost per dozen.

TABLE OF FACTORS FOR USE IN FINDING THE COST OF 100-CALORIE PORTIONS OF FOOD (*Continued*)

NAME OF FOOD	FACTOR TO BE MULTIPLIED BY PRICE TO OBTAIN COST OF 100-CALORIE PORTION, EXPRESSED IN CENTS
Meats (*Continued*)	
Lamb, leg	0.118*
Lamb, loin chops	0.078*
Mutton, leg	0.114*
Pork, chops	0.081*
Pork, tenderloin	0.114*
Sausage, beef	0.190*
Sausage, pork	0.061*
Sausage, Wienerwurst	0.069*
Turkey	0.096*
Veal, cutlets	0.149*
Veal, leg	0.176*
Milk (*see* Dairy Products)	
Molasses (*see* Sweets)	
Nuts	
Almonds, shelled	0.034*
Butternuts	0.240*
Chestnuts	0.109*
Cocoanuts, fresh	0.073*
Cocoanuts, prepared	0.033*
Peanuts, butter	0.036*
Peanuts, shelled	0.040*
Peanuts, unshelled	0.053*
Walnuts	0.116*
Oils (*see* Fats)	
Soups, canned	
Celery, cream of	0.412*
Chicken gumbo	0.524*
Corn, cream of	0.377*

* Multiply by cost per pound.

TABLE OF FACTORS FOR USE IN FINDING THE COST OF 100-CALORIE PORTIONS OF FOOD (*Continued*)

NAME OF FOOD	FACTOR TO BE MULTIPLIED BY PRICE TO OBTAIN COST OF 100-CALORIE PORTION, EXPRESSED IN CENTS
Soups (*Continued*)	
Pea, cream of	0.383*
Tomato	0.559*
Vegetable	1.613*
Sweets	
Chocolate	0.036*
Cocoa powder	0.044*
Doughnuts [1]	0.069*
Fig bars	0.062*
Ginger snaps	0.054*
Honey	0.068*
Marmalade, orange	0.065*
Molasses, cane	0.077*
Sugar, white	0.055*
Sugar, brown	0.058*
Syrup, maple [2]	0.031*
Vanilla wafers	0.050*
Vegetables	
Asparagus, fresh	0.990*
Asparagus, canned	1.220*
Beans, baked, canned	0.172*
Beans, dried	0.064*
Beans, Lima, fresh	0.400*
Beans, Lima, dried	0.063*
Beans, Lima, canned	0.286*
Beans, string, fresh	0.568*
Beans, string, canned	1.075*
Beets	0.599*

[1] Calculated on the basis that 1 doz. doughnuts weigh 12 oz.
[2] Calculated on the basis that 1 qt. of maple syrup weighs $2\frac{3}{4}$ lb.
* Multiply by cost per pound.

TABLE OF FACTORS FOR USE IN FINDING THE COST OF 100-CALORIE PORTIONS OF FOOD (*Continued*)

NAME OF FOOD	FACTOR TO BE MULTIPLIED BY PRICE TO OBTAIN COST OF 100-CALORIE PORTION, EXPRESSED IN CENTS
Vegetables (*Continued*)	
Cabbage	0.826*
Carrots	0.629*
Cauliflower	0.725*
Celery	1.470*
Corn, canned	0.225*
Cucumbers	1.470*
Lentils	0.063*
Lettuce	1.389*
Mushrooms	0.493*
Onions	0.500*
Parsnips	0.424*
Peas, fresh	0.398*
Peas, canned	0.398*
Peas, dried, split	0.062*
Potato, chips	0.039*
Potato, sweet	0.224*
Potato, white	0.331*
Pumpkins	1.694*
Spinach	0.917*
Squash	0.971*
Tomatoes, fresh	0.962*
Tomatoes, canned	0.971*
Turnips	0.806*

* Multiply by cost per pound.

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